

# Electrical Contracting

*The Magazine of*

ELECTRICAL CONSTRUCTION AND MAINTENANCE

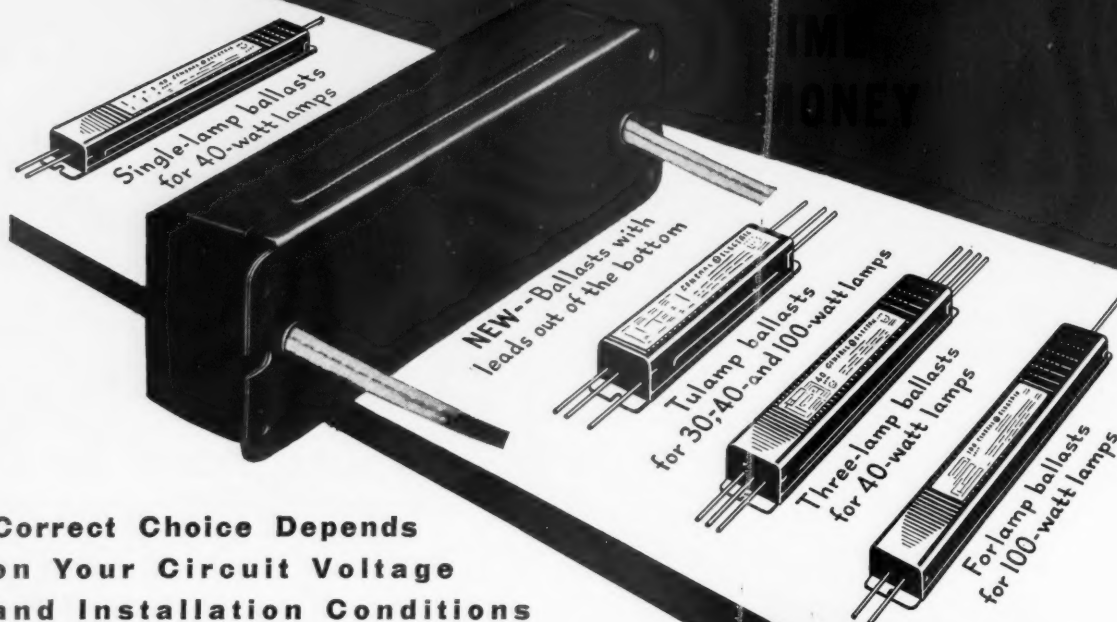


AUGUST 1943

INDUSTRIAL ELECTRIFICATION SECTION  
Pages 13-76

For War-plant Fluorescent Lighting CHOOSE THE G-E BALLAST THAT WILL

SAVE YOU THE MOST



**Correct Choice Depends on Your Circuit Voltage and Installation Conditions**

**Single-lamp ballasts**—The natural choice for installations requiring but one lamp per fixture; used most often in restricted spaces or where low levels of illumination are sufficient.

**Tulamp ballasts**—Available for all lamp ratings from 15 watts to 100 watts; conserve materials in the ballast, reduce light "flicker," cut electrical losses, require fewer fixtures for a given-sized installation.

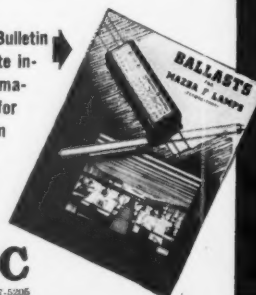
**Three-lamp ballasts**—Designed for use with 40-watt lamps on all circuits. You avoid use of two ballasts in one fixture, simplifying installations and saving materials.

**Forlamp ballasts**—For use with 100-watt lamps on 265/460Y-volt circuits; a "natural" for war-plant lighting; does the work of two Tulamp ballasts of the same rating, yet is the same physical size; in one aircraft factory

installation, the use of Forlamp ballasts instead of Tulamp saved enough copper to make 95,000 cartridge casings (20-mm) and enough aluminum to make 111,000 fuse primers.

**Ballasts with leads out the bottom**—The most recent addition to the G-E line; available in 40-watt Tulamp and three-lamp ratings, 100-watt Tulamp and Forlamp ratings; developed as an aid to fixture manufacturers in saving critical materials; can be mounted completely exposed atop a shallow wiring channel.

WRITE TODAY for Bulletin GEA-3293 for complete information on G.E.'s material-saving ballasts for MAZDA F lamps from 4 to 100 watts. General Electric Company, Schenectady, New York.



**GENERAL  ELECTRIC**

408-17-5206



**BALLASTS FOR FLUORESCENT LIGHTING**

Developed by ETL  
and approved by  
the Laboratories, Inc.

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Crow's ne  
Ladder r  
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Company  
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for two  
year, \$6.  
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# "Murray"—the modern STANDARD in maintenance ladders!

These maintenance units make overhead servicing *so* fast and easy that light output is kept at maximum.

The chief advantage of these Murray Crows'nests is that they make overhead, out-of-the-way lights, unit heaters and sprinkler heads, easily accessible, without disturbing men, machines or production schedules in the slightest.

All the many important plants which have taken on Murray Crows'nests, wonder how any plant ever got along without them. Fill in the coupon and mail—we'll propose a unit suiting your particular needs. Metropolitan Device Corporation, Brooklyn 16, N. Y.



Crow's Nest  
"Metropolitan Device Corporation"



Crow's Nest  
"Metropolitan Device Corporation"

Metropolitan Device Corp.  
Brooklyn 16, N. Y.

Send data (without obligation) on Murray Crows'nest suitable for our requirements. Ladder must reach \_\_\_\_\_ feet high, and extend \_\_\_\_\_ feet side-ways. Aisle width is \_\_\_\_\_ feet.

Name and Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

## Murray crows'nest

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# First

Explosion-Proof  
Fluorescent Lighting  
for **HAZARDOUS  
LOCATIONS**



A WELL-BALANCED UNIT WITH UN-  
USUALLY HIGH LIGHTING EFFICIENCY



## *Where and When IT'S NEEDED MOST!*

NOW night-shift war production is stepped up in plants where highly flammable and explosive dusts and gases are present, by the introduction of Appleton Explosion-Proof Fluorescent Lighting Fixtures!

For the first time, modern, efficient fluorescent lighting, with safety, is available to powder mills, chemical plants, oil refineries, rubber plants, hospital operating and X-ray rooms, flour and grain mills, and finishing departments using highly volatile lacquers.

Approved by Underwriters' Laboratories for locations in Class I, Groups C and D; and Class II, Groups E, F and G, this new Appleton equipment is expertly designed to provide a wide margin of safety. All seals and internal wiring are completed in manufacture.

Installation is quick and easy; line connections are made to terminal block in junction chamber. Auxiliary fittings shown at right simplify the job.

There are hazardous locations in your community where better light will expedite war production. Check them at once!

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1/2" Sealed  
End Cap for  
Fluorescent  
Lamp -  
Sealed  
End



Type 'L' Locking  
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Hazardous  
Locations -  
Sealed  
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Type 'U' Locking  
Connectors -  
Fit End Caps  
of Fluorescent  
Lamp Fixtures

**AUXILIARY FITTINGS FOR  
NEAT, SAFE INSTALLATION**

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# Electrical Contracting

WITH WHICH IS CONSOLIDATED THE ELECTRAGIST AND ELECTRICAL RECORD—ESTABLISHED 1901

A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering, installation, repairing, maintenance and management in the field of electrical construction and maintenance.

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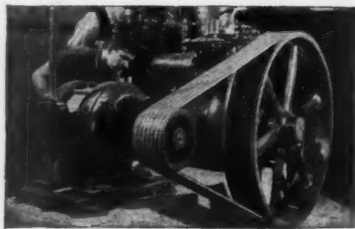
# Good Team Great Team

## ALLIS-CHALMERS MOTORS AND

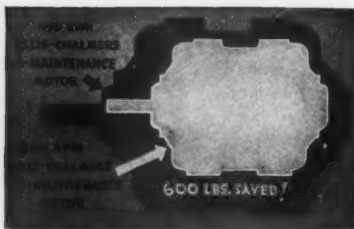
➤ Using high-speed motors with Allis-Chalmers Texrope Drives and single-speed motors with Allis-Chalmers Vari-Pitch Sheaves and Speed Changers has always been good practise. *In time of war it's a vital practise!*

➤ Such combinations give sharply higher efficiencies—at lower cost in man-hours, money and materials!

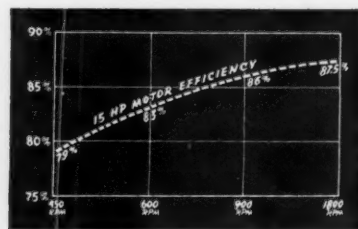
➤ Allis-Chalmers, only builder of *both* motors and V-belt drives, offers invaluable know-how in teaming them up.



**1** In most applications, an 1800 rpm motor with Texrope Drive will ably do the job of a lower-speed, direct-connected motor—at lower cost in money and materials!



**2** When you buy an 1800 rpm instead of 450 rpm 15 hp squirrel-cage motor, for example, 600 lb are saved. And you save well over \$200 — with drive figured in!



**3** Note that efficiency rises from 79% for the 450 rpm motor to 87.5% for the 1800 rpm motor. The 1800 rpm motor saves you over 30 kw/24 hr. day.



WE WORK FOR  
VICTORY

WE PLAN FOR  
PEACE

# ALLIS-CH

# in Peace . . . in Wartime!

## TEXROPE DRIVES

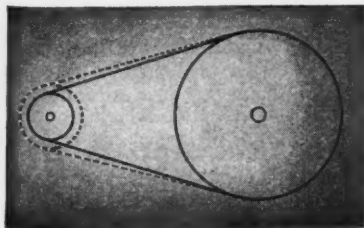


**I**T'S TIME to take a *fresh* look at motor buying! See below how much you can save with high- and single-speed motors made flexible by Texrope Drives.

Allis-Chalmers, builder of Lo-Maintenance Motors, originated the multiple V-belt drive and Vari-Pitch Sheaves . . . is the only manufacturer building *both* motors and V-belt drives. You benefit when you ask for — and get — the *right* combination of Lo-Maintenance Motor and Texrope Drive!

Call on your nearby Allis-Chalmers district office for facts, figures and advice — or write direct to ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wis.

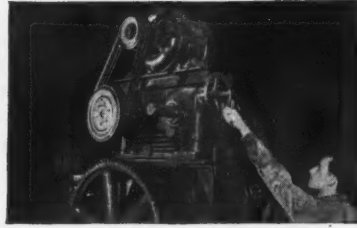
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**4** Infrequently needed speed changes can be had by changing from one size motor sheave to another. Juggling *complete* drives, range is 1:1 to 7:1.



**5** With the Allis-Chalmers Vari-Pitch Sheave, you can increase or decrease speed by adjusting sheave diameter . . . obtaining an *unbroken* series of speeds!



**6** Allis-Chalmers Vari-Pitch Speed Changer gives you infinite changes at the turn of a wheel — within 3.75 to 1. It's compact, flexible, *efficient*!

# ALLIS-CHALMERS

**LO-MAINTENANCE MOTORS  
TEXROPE DRIVES**

**BAKING • DRYING • DEHYDRATING • PREHEATING**

# Check Your Problem

## INFRARED PROVIDES THE ANSWER



Reducing processing time from hours to minutes means increased production and lower unit cost.



Processing all pieces under identical conditions means uniform results with a minimum of rejects.



Requiring less floor space means more production per square foot.

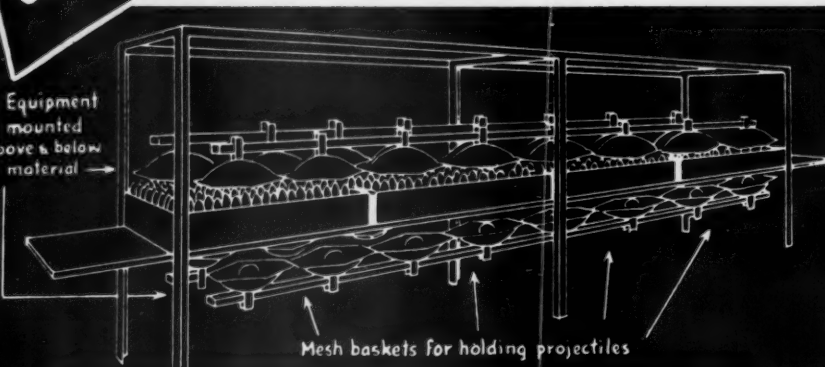


Efficient utilization of power means low energy cost per piece.



Reducing overall time for processing means less labor, less handling, and fewer manhours.

Equipment mounted above & below material



**FOR EXAMPLE**—An industrial in the Cincinnati area finds the near infrared process advantageous for drying and preheating operations in the manufacture of shells. 20 MM projectiles are dried with the radiant energy in 7½ minutes after they have been washed and coated with oil. After inspection, they are preheated for 2½ minutes prior to dipping in oil again, preparatory for packing and shipping. The amazing speed, utility, and savings of this process have been applied to hundreds of varying operations throughout industry. Case studies applicable to your production are available on request.

A remarkable aid to industrial production . . . that is Infrared. Production time reduced from hours to minutes for baking, drying, dehydrating and preheating operations — substantial material savings — floor space requirements lessened — power costs cut — fewer workers needed.

These amazing results from employment of the Infrared Process have eliminated vital problems in hundreds of war industries — created a new high record of efficiency which foreshadows the coming peacetime demand for this advanced process.

Fostoria Infrared equipment is low in service cost, quick and easy to install — economical to operate. The nation-wide organization of Fostoria Industrial Service Centers provides complete facilities for pre-determination of Infrared advantages for your production. Request full facts, today.

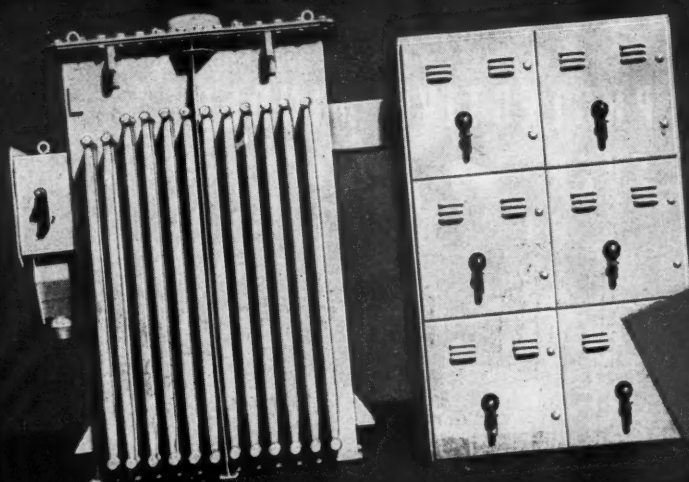
**THE FOSTORIA PRESSED STEEL CORPORATION, Fostoria, Ohio**  
In Canada—Write Amalgamated Electric Corp., Ltd., Toronto

### Call Your Fostoria Industrial Service Center FOR PRETESTING AND RECOMMENDATIONS

Fostoria Industrial Service Centers, located in principal cities, are properly equipped and well qualified to solve your baking, drying, dehydrating or preheating problem. If their practical tests prove the Near Infrared Process to be a logical solution, the proper equipment to do the job is recommended. The service provides installation supervision and stands by to help the user obtain and maintain forecasted results.







**YOU CAN  
BE SURE  
OF YOUR**

**IC**  
"INTERRUPTING CAPACITY"

## WHEN YOU BUY G-E UNIT SUBSTATIONS

The severity of a short circuit depends largely on the capacity of the substation that feeds the circuit, **NOT** on the normal load on the circuit. To assure you of *adequate* interrupting capacity for even the most severe short circuits, G-E

load-center unit substations are built with *properly rated* breakers. These are air circuit breakers which have been co-ordinated—electrically, mechanically, and thermally—with the capacity of the substation and the system.



G-E drawout air circuit breakers are properly rated—can be inspected quickly and safely—and need little maintenance throughout a long life.

### FOR DEPENDABLE PERFORMANCE—

G-E air circuit breakers have positive-acting, dual-magnetic, overcurrent trips which provide time-delay protection for overloads (adjustable from 100 to 200 per cent of the breaker rating), and instantaneous protection from short circuits. Silver-to-silver contacts, fast-acting arc quenchers, and generous current-carrying elements assure reliable operation.

### —AND EASY MAINTENANCE

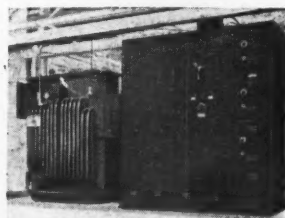
Drawout air circuit breakers, which roll in and out as easily as a file-cabinet drawer, can be inspected, tested, or replaced with another breaker quickly and safely. After a power interruption, a simple turn of the breaker handle quickly restores service. Air circuit breakers in your G-E unit substation assure an important saving in time and labor required for routine inspection and maintenance.

If you need dependable load-center unit

substations in a hurry, or simply want more complete information, get in touch with the nearest G-E office, or write to General Electric, Schenectady, N. Y.

### FOR D-C, TOO—

### RECTIFIER UNIT SUBSTATIONS



Now you can have direct-current power at your load centers by running high-voltage a-c all the way, and converting to d-c with rectifier unit substations located at those centers.

**GENERAL  ELECTRIC**  
302-18-5900


# INDUSTRY..

IS MORE PROTECTIVE MINDED  
THAN EVER *Today* . . . .



—THAT IS WHY YOU WILL FIND  
**Automatic Control thru  
SANGAMO  
TIME-SWITCHES**  
WIDELY ACCEPTED . . .

#### DURING BLACKOUTS



● During any current interruption, as for instance when a master switch is pulled for a temporary blackout, Form VSWZ Astronomic Dial Time Switch will continue to run for ten hours. An automatic carry-over feature provides for clock-spring operation when the current is off. The clock-spring re-winds automatically when the current is restored, and the time switch resumes its normal synchronous operation.

★ Factory yards, railroad sidings, building approaches, substations, transformer banks, and other vital property are using protective floodlighting more and more. Important in these installations are Sangamo Time Switches for they add Automatic Control which, in turn, secures greater operating dependability and convenience for floodlighting systems. The human element is taken out of the picture—thus lights go on and off at the proper time. The time switch featured on this page is the one to install for protective floodlighting systems.

**SANGAMO ELECTRIC COMPANY** **SPRINGFIELD ILLINOIS**

# READY! Simplified Catalog of G-E Renewal Parts

## HELPS GET PARTS FASTER



- ✓ Quickly identifies needed parts pictorially!
- ✓ Simplifies ordering by catalog number
- ✓ Speeds delivery from G-E warehouses or factories
- ✓ Gives dimensions, descriptions, prices
- ✓ Lists parts required most frequently
- ✓ Includes parts for G-E motors, control, transformers and other widely used electric equipment, also supplies, such as magnet wire, insulating materials
- ✓ Makes it easier to order quantities of parts for better fit and to get better performance

**NOW, a single book**—indexed for easy reference—can take the place of separate handbooks and bulletins for identifying and ordering most G-E renewal parts needed to keep your equipment in operation. With this book, you'll find it easier to order genuine G-E parts *by catalog number*—saving time all along the line.

For your copy, just mail the coupon. Even

though you don't need it now, it may save precious hours in an emergency. **General Electric Company, Schenectady, N. Y.**

General Electric Co., Section O 750-220  
Schenectady, N. Y.

Yes, I want a copy of your new 96-page catalog "Renewal Parts and Supplies (GEA-638)" to help simplify ordering of genuine G-E parts.

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City..... State.....

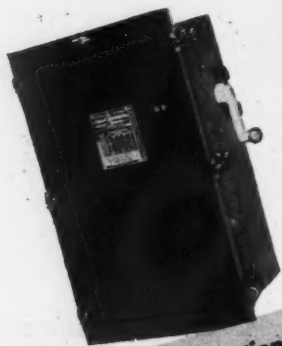
**GENERAL  ELECTRIC**



# GENERAL ELECTRIC RECOMMENDS

## Combination Starters

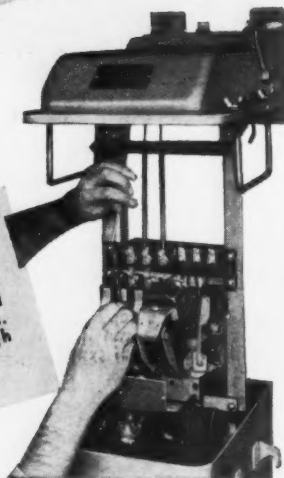
Instead of Separately Mounted  
Motor-circuit Switches  
and Starters



**Dust-tight Combinations.** For extremely dusty locations. Available through NEMA Size 5.

**General-purpose Type.** For indoor installations where atmospheric conditions are normal. Available through NEMA Size 5.

**For Corrosive Locations.** Oil-immersed. Two forms — for both corrosive and hazardous locations. Available through NEMA Size 5.



**New High-voltage Combination.** Recently developed — provides split-cycle, short-circuit protection and starting means for 2300- and 4000-volt motors.



**COMBINATION STARTERS** for motors from 1 to 1000 hp

## because . . . they save vital materials

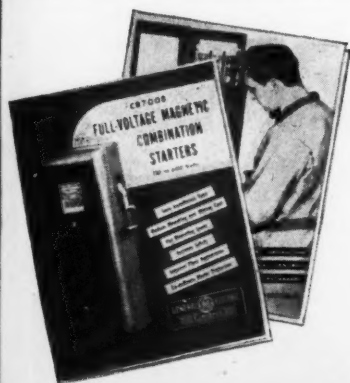
● By buying both the motor-circuit switch and the magnetic starter as one compact unit, you save the copper wire, steel conduit, and fittings that are necessary for installing two separately mounted devices—plus the saving gained by using only one steel enclosure instead of the two individual cases required for separate controls.

## because . . . they can be installed easily by "green" crews

● G-E combination starters eliminate one complete mounting job on every installation—a time saving of up to 50 per cent. They are completely wired at factory, so all you need do is to connect power, motor, and control leads—saving up to 40 per cent in wiring time.

## because . . . they reduce costly accidents

● Combining the motor-circuit switch in the same case with the magnetic starter makes it possible to mechanically interlock the switch with the door so that the door cannot be opened while the power is on. (With separate devices, there is nothing to prevent the operator from opening a case on a "live" starter.)



### *Write for these Bulletins*

CR7008 FULL-VOLTAGE  
MAGNETIC COMBINATION STARTERS  
—BULLETIN GEA-3715

NEW SIMPLIFIED GUIDE TO THE  
SELECTION AND APPLICATION OF  
COMMONLY USED MOTOR CONTROL  
—BULLETIN GEA-4015

General Electric Company, Section K 676-94  
Schenectady, N. Y.

Please send me the publications checked  
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☐ COMBINATION STARTERS—GEA-3715

☐ SIMPLIFIED GUIDE—GEA-4015

Name .....

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Address .....

City..... State.....

8920

# GENERAL ELECTRIC

# GREAT NAMES in American Progress



**ROBERT FULTON, BOAT BUILDER** — On a fateful Friday in 1807, a skeptical crowd gathered at the foot of Cortlandt Street, New York. They came to watch "Fulton's Folly" attempt the "impossible" by traveling without sails from New York to Albany. Those who came to jeer stayed to cheer. "Crazy" Bob's puffing, snorting Clermont wheezed away from the jetty and grunted upstream against the wind at the miraculous speed of four miles an hour. On that day, Robert Fulton, well-nigh penniless dreamer, revolutionized the water-borne transportation of the world.

## AMERICAN BLOWER

American Blower products have contributed much towards the progress of American industry — progress that today is making it possible for America's vital industries to outproduce the world. In the great public utilities, the steel industry, in the manufacture of petroleum products, chemicals, in food processing, mining, smelting and refining, in hospitals, schools, public buildings and homes, American Blower air handling equipment has kept pace with progress.

**CONTRACTORS—DEALERS** — We're working 100% for victory. But you can still buy American Blower products for vital war work. After victory we'll be ready with the most complete line of heating, ventilating and air handling equipment in history.



**AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN**  
**CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO**  
 Division of AMERICAN Radiator and Standard Sanitary Corporation



Utility Set





## *First of All*

### COME TAPE'S WAR JOBS

Maybe you don't hear much about tape as a valuable aid to the war effort. But it's like the PT Boats that flash in close to the enemy...zoom a torpedo to the target...and are off again in record time.

Tape doesn't make the headlines often...yet it's an integral part of the war effort. It's used in every branch of the war effort. It's used in every branch of the Armed Forces...in every industry that supplies the Armed Forces.

Naturally, these needs come first. Other orders are being filled as rapidly as possible.

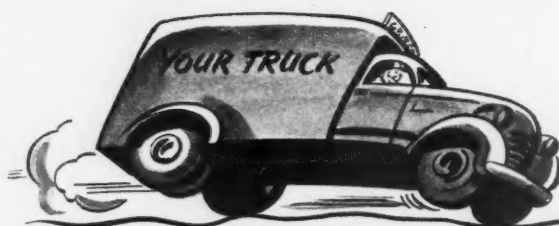
#### UNITED STATES RUBBER COMPANY

1230 Sixth Avenue • Rockefeller Center • New York

*Listen to the Philharmonic Symphony program over the CBS network, Sunday afternoon 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.*



# SECURITY ON ALL FRONTS



**GOING**  
1942

**GOING**  
1943



**TOO LATE (194?)**  
for Preventive Maintenance



### Here are three unpleasant facts for business men who neglect their trucks:

1. The civilian pool of new trucks is fast shrinking to the vanishing point. Even *essential* users will find it difficult to get a new truck.
2. There is a national shortage of replacement parts and skilled mechanics. This means more and more trucks with long lay-ups for repairs.
3. Millions of trucks are needlessly headed for the junk heap. This despite repeated urgings from the ODT to apply *Preventive Maintenance*.

**ADD UP THESE FACTS** and you see that a man who needs a truck in his business should spare no effort to keep his present truck rolling for the duration.

This you can do only through *Preventive Maintenance*—a planned and scheduled system of inspections, adjustments and servicing.

Operators of large fleets have used *Preventive Maintenance* for years because it pays dividends in longer

life, fewer road failures and lower operating costs.

Today *Preventive Maintenance* has been made easy for the owner of one or two trucks. Thousands of service stations and garages are equipped to help you by means of a simplified plan based upon the methods of big fleets.

Make arrangements with a nearby service station or garage to give your truck *Preventive Maintenance*. Do it today! It's the surest way to keep your truck operating for the duration!

Published by the **ETHYL CORPORATION**, Chrysler Bldg., New York City, manufacturer of Ethyl fluid, used by oil companies to improve motor and aviation gasolines.

**PREVENTIVE MAINTENANCE**  
***SAVES TRUCKS***

# THERE *IS* SOMETHING YOU CAN DO TO PREVENT WAR PLANT LIGHTING FAILURES



THE RLM LABEL HAS STOOD AS A SIGN  
OF QUALITY IN INDUSTRIAL LIGHTING  
REFLECTORS FOR MORE THAN 20 YEARS

● What would be the losses in war production if the lighting in your plant should fail? Production losses due to complete or partial blackouts result from many other causes than night air raids. Such "blackout" losses—which are as unnecessary as they are costly—result from (1) too little light for efficient seeing; (2) lighting that causes eyestrain and fatigue; (3) lighting equipment that fails under severe service.

To guard against such lighting failures, insist that the industrial lighting fixtures you install are engineered and built to RLM Specifications. You can be certain you are getting this insurance against "war production blackouts" if your industrial lighting units are certified by the RLM LABEL.

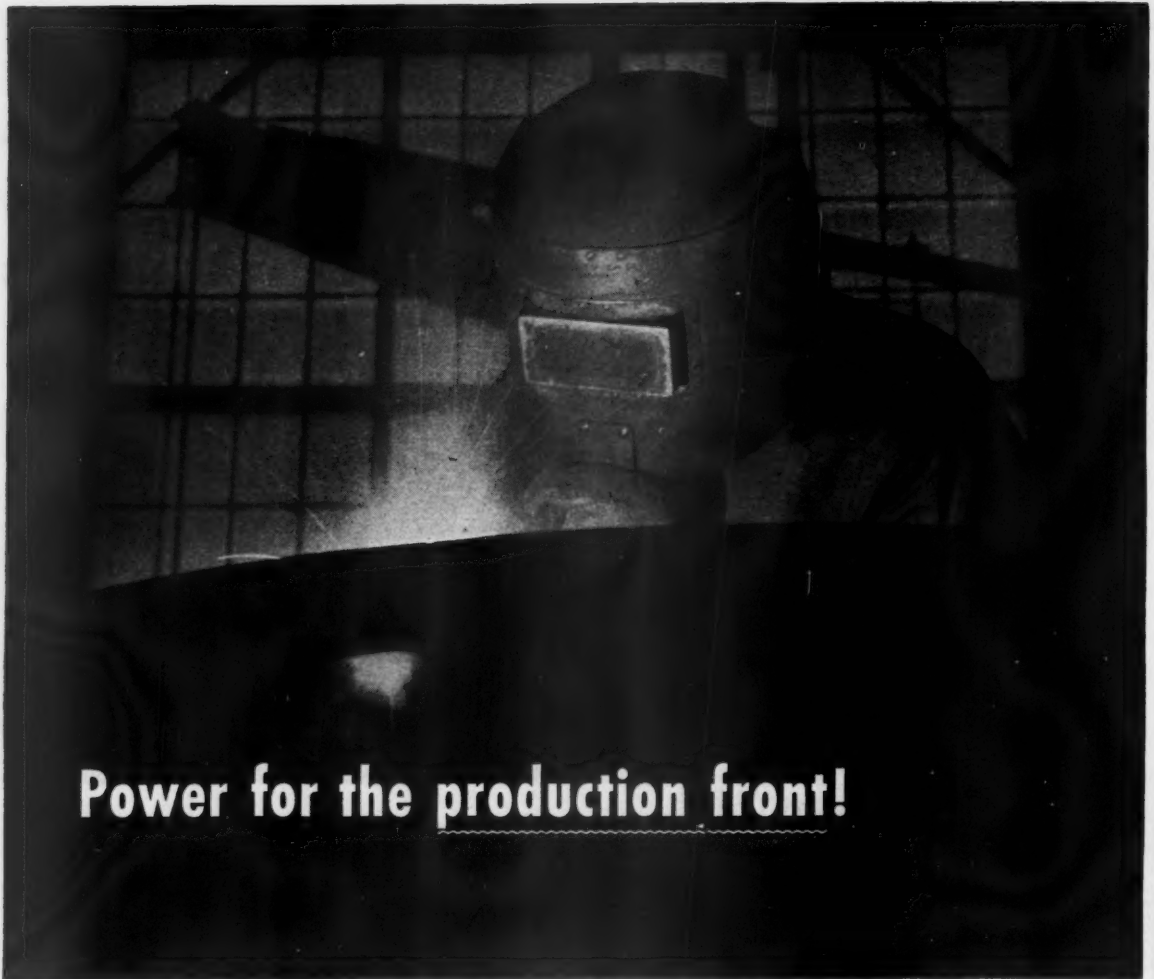
Industrial Lighting Fixtures made in accordance with RLM Specifications...and certified by the RLM LABEL...are designed and constructed with that extra safety factor so vital today. They also provide highest lighting efficiency, maximum power conservation, lowest maintenance cost. Their reflectors of pocolain enamel...the most practical of all known reflecting surfaces for most industrial lighting purposes...are unaffected by mechanical strains, smoke, fumes, grime, dust and atmospheric conditions...are non-porous, easily cleaned, fadeproof, non-peeling and non-breakable. For full particulars write any manufacturer or distributor of RLM Industrial Lighting Units, or RLM Standards Institute.

The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

**RLM STANDARDS INSTITUTE**  
INCORPORATED

200 N. MICHIGAN AVE. SUITE 1800 CHICAGO, ILL.





## Power for the production front!

**W**ELDING has probably contributed more to the improvement and speeding up of war production than any other single process. It saves time and money. It is a potent production weapon that women have learned to use as skillfully as men.

Here, again, electricity plays a vital role. Unfailing electric power must feed these modern tools. And unfailing power requires unfailing transmission and distribution—a job that can be entrusted only to electrical wires and cables of the finest quality.

For years, American Steel & Wire Company engineers and production experts have experimented with new

methods and new materials to improve the quality of our electrical wires and cables. The war proved the soundness of this policy, for the sudden scarcity of certain critical materials did not catch us napping. New materials were available to help the conservation program without sacrifice of quality or performance. Our products were ready when the emergency came; and they'll be ready when peace comes.

For our research goes steadily on—working on new ideas and developments to take care of the increased wartime demand for power and light and the ultimate conversion to peacetime requirements.



## AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago  and New York

Columbia Steel Company, San Francisco, Pacific Coast Distributors

United States Steel Export Company, New York

# UNITED STATES STEEL

# CENTRAL RIGID STEEL CONDUIT



## PROTECTION for vital power

**P**OWER circuits today *must* be kept in uninterrupted service. You *can* protect them, surely and economically by using Central Rigid Steel Conduit. Its long record of dependable service in many kinds of installations recommends it.

## SPANG-CHALFANT

Division of The National Supply Co.

**Executive Offices: Pittsburgh, Pa.**

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me?... in a rut?

**Nonsense!** Among contractors and engineers throughout the country, I'm known as a top-ranking...

But whoa! I see what you're driving at. You mean, am I really "up" on *all* the newest developments? Have I been following precedent too long... relying on the old long-established methods? Are there better ways, *newer* ways, of doing some things which I haven't yet investigated?

*Ventilation*, for example. Is there a way to provide *more effective* ventilation—a modern, economical way—that I'm not familiar with?

*Why don't I send for that free booklet of ILG's?*—the one incorporating the newest developments in ventilating theory and practice!

**ILG ELECTRIC VENTILATING CO.**  
2879 N. Crawford Avenue, Chicago, Ill.  
Offices in 39 Principal Cities

**YOU'LL NEED TO KNOW** up-to-date methods of ventilation as your problems change with the *changing times*. This big, free 88-page book—condensed and indexed for quick reference—belongs on the desk of every contractor and engineer! It's the culmination of 37 years of experience with all kinds of ventilation—in homes, stores, plants, skyscrapers, structures of all kinds—with graphic examples of every type of ILG installation. Regularly priced at one dollar a copy—but sent *free* to contractors and engineers. Write—on your letterhead—today.



Quality costs less...in the long run! That's why so many leading contractors and engineers specify ILG Direct-Connected Universal Blowers, Self-Cooled Motor Propeller Fans and "Vital Zone" Unit Heaters. Get latest catalogs now!





**VITALIZED VENTILATION**

AND AIR CONDITIONING

**AIR CHANGE...NOT JUST AIR MOVEMENT!**



# Jobs scarce?



## ... Why not go after ship wiring jobs?

**M**ANY electrical contractors — even in inland locations — are strategically located so that they can handle some shipwiring business in addition to their regular contracting work. The transition is not difficult and several contractors have built up a ship and shipyard wiring business that dwarfs their regular contracting work. Case studies of such instances have been reported from time to time in the trade papers.

Hazard has been manufacturing marine type, shipboard and shipyard cable and wire (typical examples shown below) for many years and a substantial portion of our production is devoted to this type.

These Hazard marine, shipboard and shipyard cables and wires are of the same high quality of engineering design and workmanship as those you have been using in other types of electrical work.

Our engineers will be glad to consult with electrical contractors and furnish any information we have available that will assist them in making the transition.

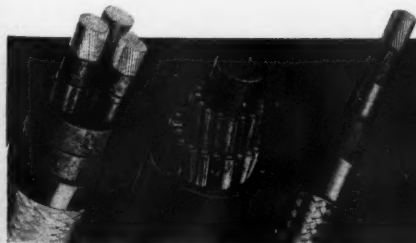
Keep your men on essential jobs that will contribute to the winning of the war!

### HAZARD INSULATED WIRE WORKS

Division of The Okonite Company

Works: WILKES-BARRE, PA.

Offices in Principal Cities



# HAZARD

ELECTRICAL WIRES AND CABLES

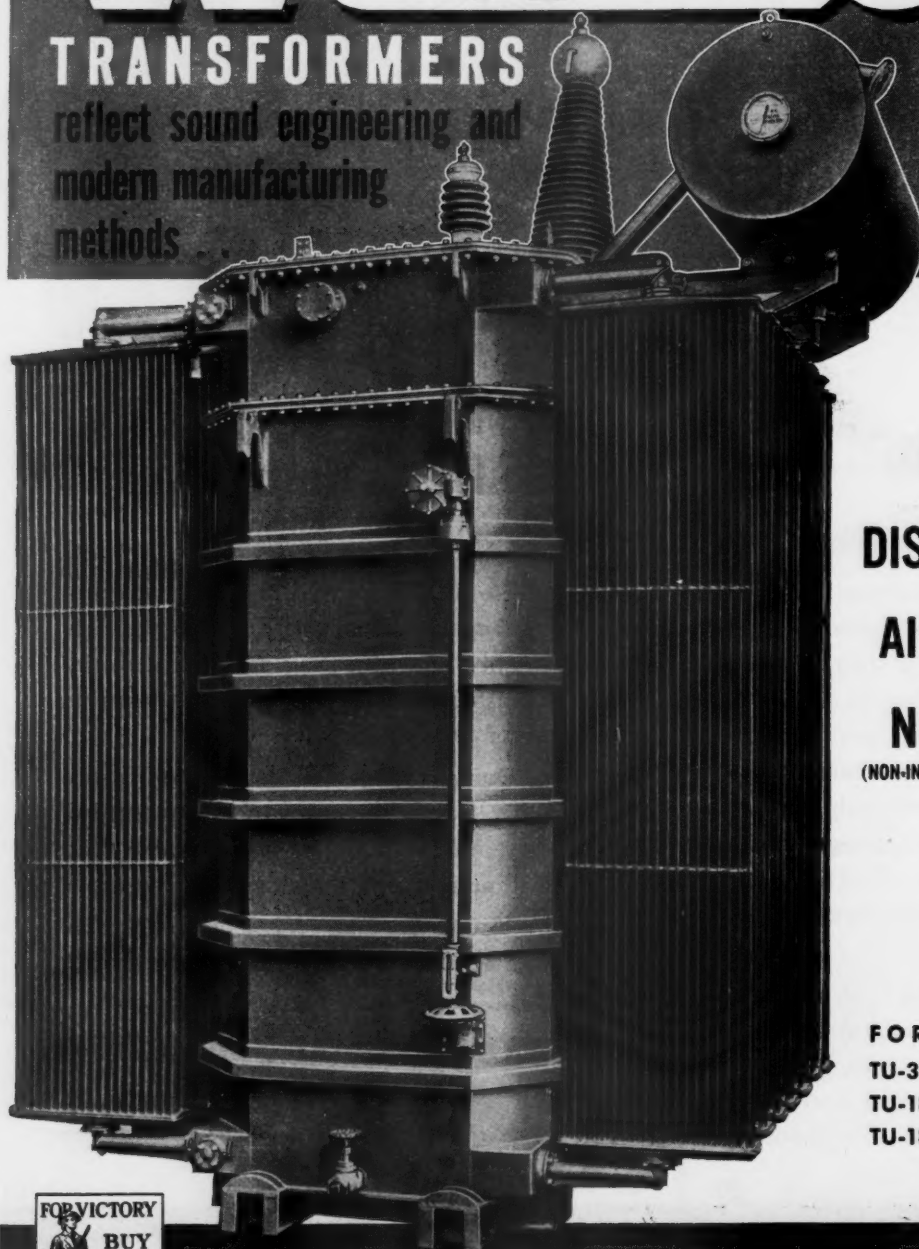
3314

*In time of war and in time of peace . . .*

# Wagner

## TRANSFORMERS

reflect sound engineering and  
modern manufacturing  
methods . . .



**POWER**  
★  
**DISTRIBUTION**  
★  
**AIR-COOLED**  
★  
**NOFLAMOL**  
(NON-INFLAMMABLE LIQUID FILLED)



*Write*  
FOR BULLETINS  
TU-33 (NOFLAMOL)  
TU-181 (POWER)  
TU-180 (DISTRIBUTION)



T43-3A

### Wagner Electric Corporation

ESTABLISHED 1891

6413 Plymouth Avenue, St. Louis, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS



# New **MITCHELITE** Design Sets the Pace in Fluorescent Fixtures for War Industry

First to give you this  
simpler, more flexible  
"lightweight" fluo-  
rescent fixture under  
the latest WPA regu-  
lations.

Four Basic Models answer every  
lighting need. Each model can  
be used for both individual and  
continuous row lighting, for  
surface or suspension mount-  
ing. FLEUR-O-LIER Approved.

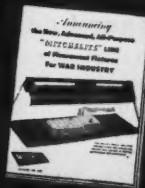
Easier, more econom-  
ical to install and  
maintain. Complete  
line of accessories  
and fittings provide  
for every method of  
mounting or hanging.



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**MITCHELL** Manufacturing Co., 2525 Clybourn Avenue, Chicago



# "-more planes than all



## **Speed on Sub-Assembly**

At every step in plane production, from plans to final "gas and go," "See-ability," through better lighting, helps save time and materials.

# the rest of the world "

**"SEE-ABILITY"**  
helps make them  
in the world's  
best-lighted plants

TODAY, the speed of the nation's aircraft production is amazing even ourselves. In this effort, "See-ability" is playing an important part. For through better lighting, men and women are working to closer limits, working with less fatigue, turning out better planes faster. All this calls for millions of Westinghouse Mazda Lamps, cuts deeper into the nation's supplies of nickel, copper, tungsten. That is why in our advertising we are asking users of lamps to conserve—to get the utmost in "See-ability" from their present equipment.

New high standards of industrial lighting are being established today, in many of our war factories. And today, our job is to supply the lamps these factories require. Tomorrow, when materials are again available, these new standards will set the pace for all industrial lighting. Even greater opportunities, therefore, await every man in the lighting industry. Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, N. J.



## Westinghouse

**MAZDA LAMPS**

FOR GREATER "SEE-ABILITY"

# What has LIGHT to do with a B.A.R.?



**PLENTY.** There are a lot of parts in a Browning Automatic Rifle—slide and piston, bolt link, ejector, firing pin, bipod, sere. . . . They've all got to fit so well and fire so fast that they deliver the goods at 560 rounds a minute!

Some gun! Some parts!

Peacetime systems of industrial lighting are wholly inadequate for round-the-clock production of precision parts like these. War work efficiency demands something better—a flood of non-glaring, non-tiring, shadowless light. In two words—Cold Cathode.

But Cold Cathode is only as good as its transformers. Therefore, leading illumination engineers specify SOLA COLD CATHODE LIGHTING TRANSFORMERS. Sola transformers are a sturdy safeguard against low-voltage flicker or overload failure at some critical moment. They're an assurance of trouble-free operation.

Every significant improvement in luminous tube transformers during the past twelve years has originated in Sola laboratories. Find out what this record can mean to you. Send for bulletin JLT-96

## Cold Cathode Lighting Transformers

# SOLA

Transformers for: Constant Voltage • Cold Cathode Lighting • Mercury Lamps • Series Lighting • Fluorescent Lighting • X-Ray Equipment • Luminous Tube Signs • Oil Burner Ignition • Radio • Power • Controls • Signal Systems • Door Bells and Chimes • etc. SOLA ELECTRIC CO., 2525 Clybourn Ave., Chicago, Ill.





*Freedom of Initiative*

At the end of the 1900-1905 period, the operations of The Youngstown Sheet and Tube Company were highly profitable. Some corporations might have been content to rest upon their laurels at this time. The Shareholders of not a few companies would have preferred to enjoy a period of large profits and proportionate dividends than to risk for a greater future by further expansion. This, however, was not the spirit of the men of action and initiative who planned the future of this company.

In 1906 the new steel plant, Bessemer converters, rolling mills, etc., were placed in operation. In 1907 coal lands totaling 1348 acres in Greene County, Pa. were purchased; new tube mills with coupling shop and additional manufacturing facilities were installed and construction of Blast Furnaces authorized. In 1908 an operating rod, wire and nail plant adjacent to the original plant was acquired and the new blast furnaces were completed.

A large part of the new construction and additions to the production facilities of the company were financed from profits. To supplement the necessary financing, the capital stock was increased in 1907 from \$4,000,000 to \$6,000,000.

The American principle of freedom of initiative which nurtured the growth of this great industrial organization has been the life blood of this nation.

With this freedom kept alive, we may all expect to share in making post-war America happier and stronger than we have ever seen it.

**The YOUNGSTOWN**  
**SHEET AND TUBE COMPANY, Youngstown, Ohio**  
 Manufacturers of  
**CARBON • ALLOY AND YOLOY STEELS**

Pipe and Tubular Products • Sheets • Plates • Conduit • Bars • Tin Plate  
 Rods • Wire • Nails • Tie Plates and Spikes • Alloy and Yолоy Steels



# Modern Signal Systems

**1. STREAMLINE YOUR DISTRIBUTION!**

**2. BUILD PEACE-TIME GOOD-WILL!**

## Signals that get action!

That's what you want to suit your trade and make orders come easy,—both for present war production and to help swing back into peace-time business.

## Signals for every job!

There's a SCHWARZE - FARADAY Audible Electrical Signal for every industrial need,—as well as institutional and marine. From wide range of styles and great variety of tone, you have easy selection to meet your prospect's requirement. (And our signal engineers will supply analytical engineering service if desired.)

## Installation Quick and Easy

The many new signals of advanced design developed by this pioneer manufacturer are rendering valuable service in war plants today. Their extra performance, **EASIER INSTALLATION**, minimum maintenance, positive dependability, are outstanding qualities that assure repeat business.

Schwarze-Faraday Signals include Horns, Bells, Buzzers, Sirens, Air-Trumpets, Chimes, in wide variety of tone, size and style. For example:

### UNI-PACT BELL.



Latest advancement in signal design. Special mounting features make this bell signal interchangeable with horns and Kodaires. Just "plug in".

### STANDARD HORN.



One of many styles and shapes, which include megaphone, two-way, drum, short and flush. Supplied for either A.C. or D.C.; vibrating, single-stroke types, etc.

### HEAVY DUTY BUZZER.



Chosen for signal work of vital importance on control equipment of U.S. Army and Navy. Many other types.

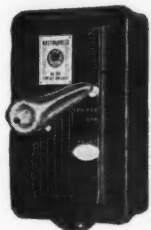
COMPLETE ILLUSTRATED AND INDEXED CATALOG FREE ON REQUEST

# SCHWARZE ELECTRIC COMPANY

1908 CHURCH STREET • ADRIAN, MICHIGAN



# the greatest **"FIRE-EATING"** act in the world!



A circuit breaker must do more than just interrupt the circuit when overloads occur. It must open the circuit *before* danger strikes and it must control the arc that results.

The Westinghouse "De-ion" Circuit Breaker does both these jobs. First, this protective device out-guesses the current; beats dangerous disturbances to the punch. Harmless overloads are passed without interruption—but once the circuit is threatened, the sensitive Bi-metal element goes into action, *quick!* The current's broken, the arc quenched, in the blink of an eye.

Second, it controls the arc. The "De-ion" arc quencher divides and extinguishes it so fast that arc burns and pits are minimized. Contact life is greatly lengthened. And service is easily restored. Once the disturbance has been corrected, a simple flip of the indicating handle restores the circuit in seconds. No long waits for the maintenance man; no parts to replace or repair.

Protect your vital equipment and circuits with Westinghouse "De-ion" Circuit Breakers. Ratings up to 600 amperes; enclosures for practically every type of service. Call your Westinghouse representative today. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-21285

## Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

### "DE-ION" CIRCUIT BREAKERS

#### "THE BIG BUILD-UP"



is provided by this Westinghouse Bi-metal element. Two metals which react differently under heat are bonded together. Threatening overloads cause this Bi-metal to bend, tripping the interrupting mechanism, opening the circuit.

#### THE GREAT "DE-ION"



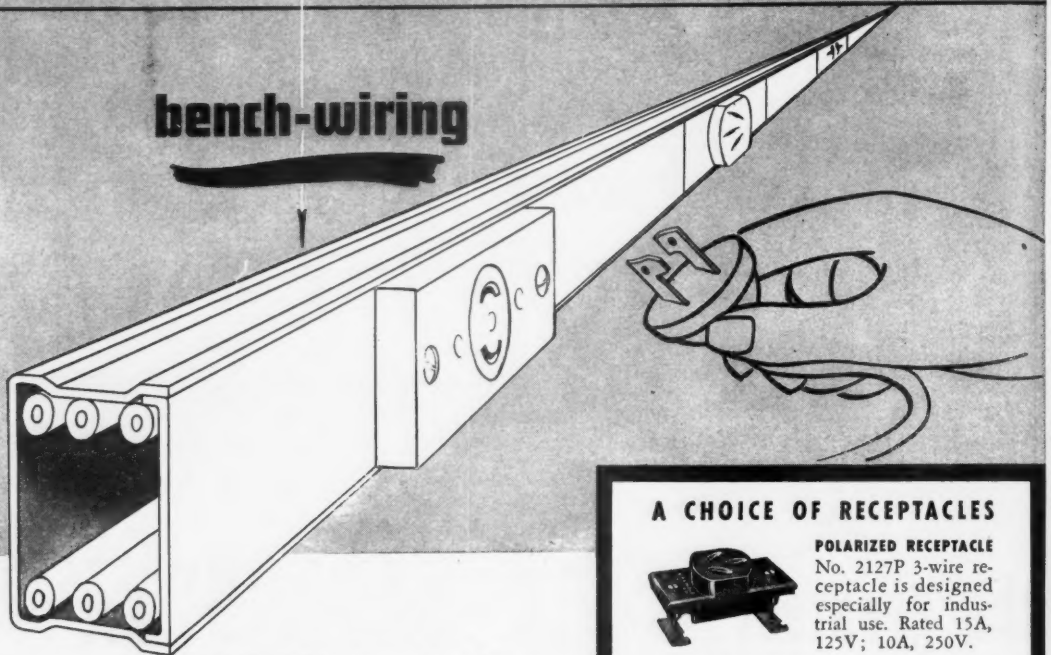
quenches the arc. Made of parallel metal plates in the form of a grid, this "De-ion" arc quencher draws the arc into the chamber, divides it into segments, smothers it between the plates . . . all in the space of half a cycle.





# PLUGMOLD

**bench-wiring**



## ● PLUGMOLD Plug-in-anywhere System

Wiring meets an immediate need in the majority of industrial plants for work-speeding, space-saving industrial convenience wiring that complements work-simplification methods.

No. 2100 PLUGMOLD, with a choice of industrial type receptacles for electrical hand tools, work lights, test devices and bench appliances, places outlet receptacles in any desired number *exactly* where they are needed by workers . . . at bench level, along assembly tables, in the laboratory, drafting room or office. Outlets can be added or relocated with little disturbance to workers. Original installation or extensions can be made with a minimum of critical materials for a given electrical load capacity. Plugmold also promotes safety by eliminating dangerous long extension cords . . . saves constant cord replacements and breakage of connector plugs. Conforms to Federal Specification W-R-32. Listed by U. L. The Wiremold Company, Dept. EC-8, Hartford 10, Conn.

Write for industrial Wiring Bulletin and Engineering Data Sheets.



## A CHOICE OF RECEPTACLES



**POLARIZED RECEPTACLE**  
No. 2127P 3-wire receptacle is designed especially for industrial use. Rated 15A, 125V; 10A, 250V.

## T-SLOT RECEPTACLE

Designed to accommodate plugs with either parallel or tandem blades. No. 2127S is rated 15A, 125V; 10A, 250V.



## EASY TO ASSEMBLE AND WIRE



Connections easily made to ends or base.



Wire receptacles, insert in channel and snap on cover.

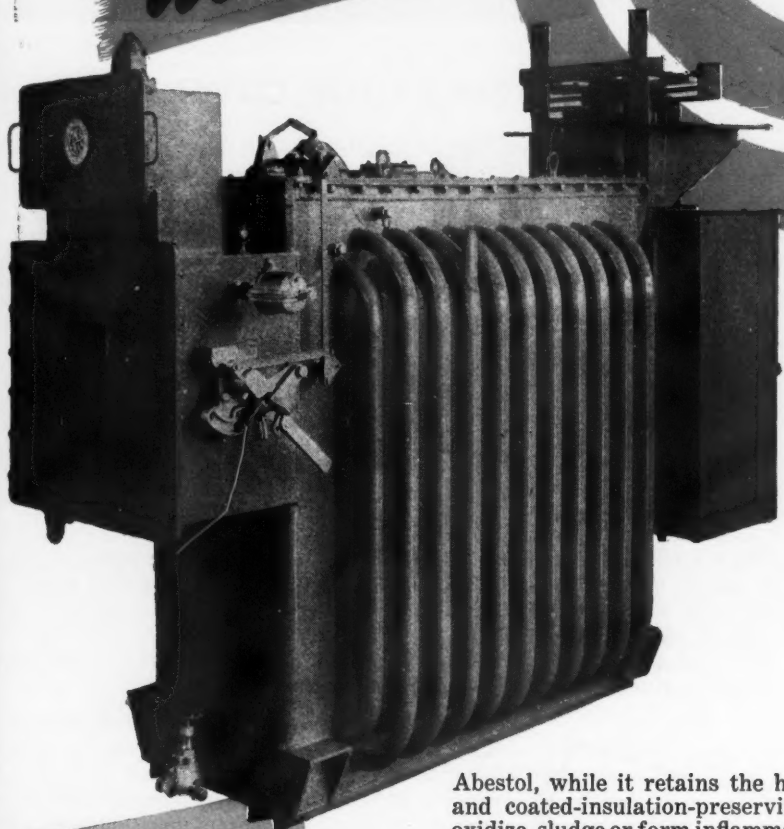
# WIREMOLD

**PRODUCE FOR WAR...AND PLAN FOR PEACE**

**CAN HELP YOU**

# Consider these advantages of ABESTOL TRANSFORMERS

*at load centers!*



**1** No vault necessary.

**2** Substantial savings  
in secondary copper.

**3** Reduced line loss.

**4** Less maintenance.

Abestol, while it retains the high dielectric strength, cooling and coated-insulation-preserving properties of oil, does not oxidize, sludge or form inflammable gases. Since Abestol Transformers offer no fire or explosion hazards, they may be placed at load centers with all the advantages such locations permit.

In addition, the inherent self-protection for which AmerTran Transformers have been noted is included. So are high turn-to-turn insulation and coil vacuum impregnation. Rigid core construction, balanced coil design, optimum impedance, these and other features have made AmerTran engineering and construction a standard of excellence for 42 years. American Transformer Company, 178 Emmet St., Newark, N. J.



PIONEER MANUFACTURERS OF  
TRANSFORMERS, REACTORS  
AND RECTIFIERS FOR  
ELECTRONICS AND  
POWER TRANSMISSION

## AMERTRAN

MANUFACTURING SINCE 1901 IN NEWARK, N. J.

# FLANGED END HEADS SIMPLIFY Vertical MOUNTINGS OF

## R & M Uni-Shell INTEGRAL HORSEPOWER MOTORS

### VERTICAL MOTORS WITH DRIP-PROOF COVERS

Vertical *Uni-Shell* Motors with drip-proof cover and special base. A wide variety of flanged end heads, ring, and tripod bases are available.



The vertical D. C. motor is made drip-proof with special end head covers. All flanged heads or lower bases developed for other types are available for D. C. frames.



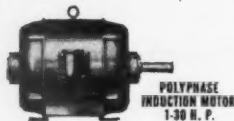
Vertical type of capacitor-start induction run motor with drip cover and external capacitors. All flanged heads are completely interchangeable for all motor types.



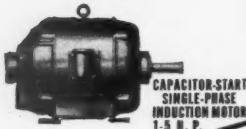
All of the motors shown above use the same flanged head, but many other flanges, standard and special, can be supplied. It is important to remember that such heads are interchangeable for Single-Phase D.C. and Polyphase motors.

#### ONLY END HEADS CHANGE

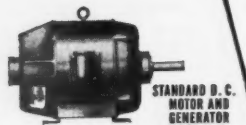
Every dimension, from *Uni-Shell* motor body to head fit, is identical for all motor types.



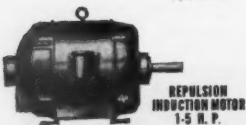
POLYPHASE  
INDUCTION MOTOR  
1-30 H. P.



CAPACITOR-START  
SINGLE-PHASE  
INDUCTION MOTOR  
1-5 H. P.



STANDARD D. C.  
MOTOR AND  
GENERATOR  
1-7½ H. P.  
¾-5 H. W.



REPULSION  
INDUCTION MOTOR  
1-5 H. P.

### COMPLETE INTERCHANGEABILITY IN ANY ONE FRAME SIZE

The R & M *Uni-Shell* Motor represents the development of a revolutionary idea in electric motor design. In all types of *Uni-Shell* motors, the shell length, diameter, base mounting holes, shaft dimensions, height of shaft above base, head fit and bolt circle mounting for heads are exactly the same for any frame size. Only the end opposite the shaft extension varies from one type to another and then with only a slight change in external appearance.

And even beyond this complete interchangeability, R & M *Uni-Shell* Motors are far in advance—the finest and longest-lived motors that R & M has built in nearly 50 years of motor specialization. Trouble-free bearings and alignment, precision-balanced rotors, new and better methods of insulation, low interior temperatures and other exclusive features are engineering achievements which bring important benefits to every *Uni-Shell* user. Mail the coupon for an interesting 20-page booklet on the R & M *Uni-Shell* line and its advantages.

#### *Uni-Shell* ADVANTAGES

- 1—Complete interchangeability in any one frame size.
- 2—Trouble-free bearings and improved insulation for longer life.
- 3—Many interchangeable flanged end heads for vertical or horizontal mounting.
- 4—Adaptability to drip-proof, splash-proof and totally enclosed fan cooled construction.
- 5—Polyphase Induction, Direct Current and Single-Phase Induction types.

#### SEND FOR THIS 20 PAGE BOOKLET!

ROBBINS & MYERS, INC., Springfield, Ohio

Gentlemen: Please send me your new 20-page booklet on *Uni-Shell* Motors.

Name.....Position.....

Company.....

Street Address.....

City.....State.....

I would ☐ would not ☐ like to talk to a representative. ECS

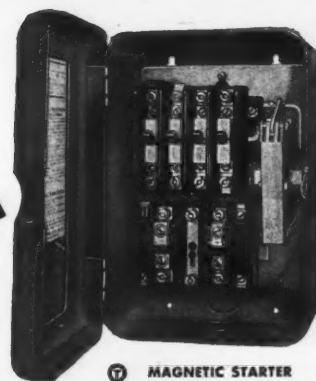
**ROBBINS & MYERS • INC.**

MOTOR DIVISION, SPRINGFIELD, OHIO

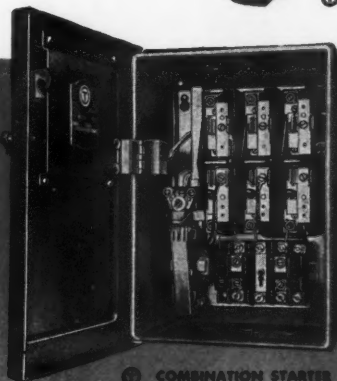
HOISTS & CRANES • MACHINE DRIVES • FANS • MOYNO PUMPS • FOUNDED 1878



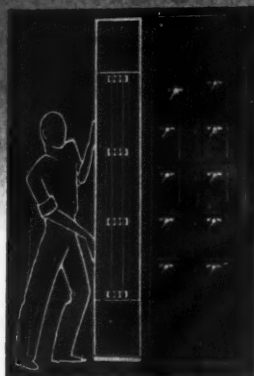
# they make it easier...



⑦ MAGNETIC STARTER



⑧ COMBINATION STARTER



⑨ MOTOR CONTROL CENTER

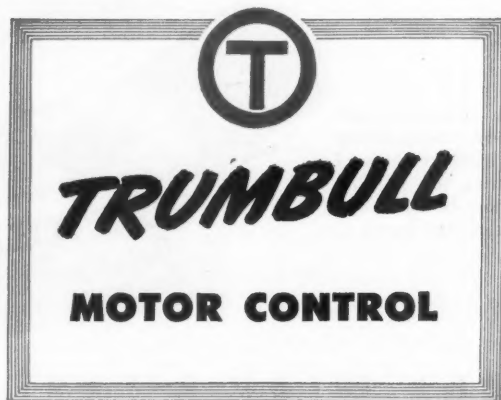
## to meet **PRODUCTION QUOTAS**

**WEED OUT "WEAK SISTERS."** During the period immediately ahead industrial production will be called upon to maintain steady continuous peak output. This will be a tremendous strain on equipment of every type and especially on machine motor controls. Now is the time to take stock of the condition of this equipment in every industrial plant. Replace where replacement is absolutely necessary. Watch maintenance carefully.

**QUICK INSTALLATION, STOCK UNITS.** Trumbull Magnetic Starters, Combination Starters and Motor Control Centers together form a coordinated range of equipment to meet the great majority of all requirements, including many complex centralized multi-motor control installations that might otherwise entail time consuming special engineering. Trumbull Motor Control Centers, permitting assembly of all necessary motor control apparatus with "building block" speed and simplicity, especially meet the needs of war industries. At the same time this equipment . . . easily regrouped or extended . . . provides the flexibility industry must have against future developments.

### LESS MAINTENANCE ... FEWER OUTAGES

Trumbull construction, providing for wiring, inspection and removal of control mechanisms from the front is an outstanding feature. Vertical contact design prevents dust accumulation, reduces maintenance.



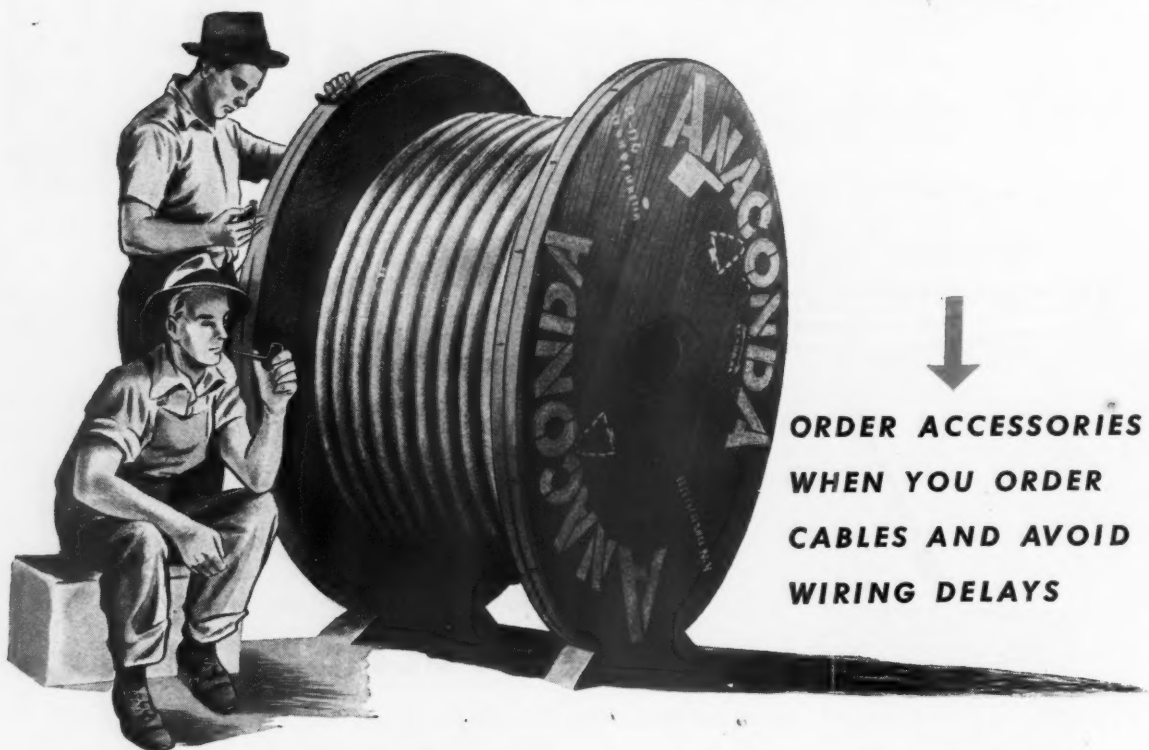
### FLEXIBILITY FOR LATER CHANGES

In Trumbull Motor Control Centers, individual control units are assembled on Vertical Sections from the front by "stab connections" to busses. Units may thus be regrouped at any time.

Write for Trumbullad Bulletins 322, 330, 338.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION  
OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

# War Time is Priceless!



**E**VEN before the war, the common practice of waiting to order cable accessories until the cable for the job had been shipped frequently caused days of delay.

Today, however, it may even take a month or more before an accessories order can be approved and materials started on their way.

This holds up the wiring job unnecessarily. In the meantime, workers may be idle—and not just electricians alone, for other workers all along the

line may be affected. Today, if never before, follow this wartime-saving practice:

- 1** Order accessories and cable at the same time —for delivery together.
- 2** When ordering unit package jointing material, include your order for terminals and potheads. If buried cables, remember joint boxes. 43232

Every Anaconda unit package contains instructions and all materials required for the particular job. When ordering, please specify number of unit packages needed, operating voltage, size, number and shape of conductors, thickness and kind of insulation, thickness of lead sheath of cable.



## ANACONDA WIRE & CABLE COMPANY

GENERAL OFFICES: 25 Broadway, New York City

CHICAGO OFFICE: 20 North Wacker Drive

Subsidiary of Anaconda Copper Mining Company  
Sales Offices in Principal Cities

---

# Management

## —Heart of America's Industrial Progress

*In Peace and War, Management Men and Methods Steer  
Production on a Steady Upward Course*

---

WHEN the Allied armada of 2,000 ships, protected by a vast umbrella of planes, struck the coast of Sicily, Axis leaders once more had reason to wonder how "that decadent, pleasure-loving America" had swung from the manufacture of automobiles, refrigerators and costume jewelry to equipments of war, and had out-produced such mighty plants as the Krupp, the Fiat and the Skoda works — and had done it so quickly.

America at war is in the lead just as it has led a world at peace. Super-performing planes are taking to the air at the present rate of nearly 100,000 per year. Ships, to carry the war to our enemies, slide down the ways at the rate of two a day. Tanks, trucks, guns, ammunition are pouring out of our "peace" plants in far greater volume than the entire Axis effort can possibly equal. War expenditures in 1943 alone will reach the staggering figure of approximately \$83,000,000,000 — an amount equal to our entire national income for 1929. Added to this is the rock-bottom output of essential civilian goods — a very considerable item.

This unprecedented production is taking place while some 9,000,000 men and women, those physically best equipped, have been called to the armed forces. Many of them were taken from industry, and their loss could be repaired only by more efficient equipment and more effective methods.

Rigorous training programs had to be superimposed upon many other abnormal problems facing industry in its high-speed conversion from stoves to boats; from printing machines to guns; from automobiles to airplane engines; from fishing tackle to bomb sights.

This phenomenal task was further complicated by the need for rapid expansion. A modest machine tool industry had to be expanded to handle a volume many times its normal capacity. Steel production had to be increased by 20%, and that of aluminum and magnesium multiplied over and over. From almost nil, the demand for high octane gasoline soared to unbelievable quantities. The creation of synthetic rubber and electronic industries was necessary almost overnight.

Who deserves credit for these accomplishments? All industry! The engineers, chemists, designers, skilled workers, common laborers. But over and above all it belongs to management.

In industry it is mandatory to have a directive force to co-ordinate the efforts of men in the use of materials and the application of power toward the production of goods and services. The application of this directive force is the function of management, and only because we had today's kind of management were we able to transform ourselves, almost overnight, from a peace-loving nation to the world's greatest producer of implements of war. As a nation, we had been preparing for a long time to play our part in world affairs. This preparation, certainly not planned for today's objectives but none the less effective, began some four decades ago.

With the advent of the twentieth century, the character of industry in the United States, and, therefore, the character of American living, began to change. Scientific management was born. Frederick W. Taylor brought into focus and showed how to use effectively those processes and procedures upon which our present-day mass production is based. He was followed by Harrington Emerson, who made the industrial world acquainted with efficiency in manufacture and the remarkable progress to be gained therefrom in the field of production, with its consequent price reductions and wider distribution of industry's products. There followed, in industry, an alert management, a capable management, a management with vision. Without it, the work of Taylor and Emerson would have gone for naught.

It is because of this early work of management — and the extraordinary developments it produced — that the country as a whole, and particularly those employed in industry, were not over-awed by the seemingly impossible job of quick conversion to all-out war production. But let us look back four decades and examine some of those preparatory accomplishments which have proven so vital to the progress and welfare of the nation.

From 1900 to 1939 (the last pre-war year), total employment of all kinds increased 52 per cent; in the manufacturing industries alone the increase was 84 per cent. *The nation became definitely industrial.*

In 1900 the average wage earner was able to spend only 20.2 per cent of his income for things other than necessities; in 1930 his buying power for non-essentials had increased to 34.8 per cent. *The average man acquired confidence in what industry could do.*

In 1900 the average work week was 56 hours; in 1930 it was 48 hours. *The burden of production was being transferred from man to machine.*

In 1939 the United States possessed 30 per cent of the world's railroads, 72 per cent of its automobiles, 49 per cent of its telephones. *The nation's production equipment had grown to formidable proportions.*

In 1939 nearly half of the families in the United States owned their own homes, 64 million individuals carried life insurance policies and 45 million had savings accounts. National income had increased 300 per cent from 1900 and during the same period the proportion of national income paid out in salaries and wages increased from 58 to 70 per cent. And in less than this period (1914-1939) the purchasing power of the wage rate increased by 60 per cent. *There had been evolved the kind of living for which men will work — and fight.*

Since 1900, factories increased their output of goods from \$11,000,000,000 to \$60,000,000,000 in 1939. This increase of nearly 450 per cent was accomplished while the country's population rose only 60 per cent. In this same span of years, technological developments and improvements in methods had



increased the value added by manufacture per wage earner by 200 per cent, and the horsepower per factory worker had been multiplied by  $2\frac{1}{2}$ . The nation's production plant was ready to assume its gigantic wartime job.

During this period of industrial and national evolution, management itself had changed. Prior to the advent of scientific management, our goods and services were the product of several kinds of directive activities, varying from the strictly paternalistic to the ruthless. There was little conception of the responsibility that industry now broadly acknowledges — the responsibility of trusteeship in the interest of stockholders, employees and the public — specifically, in the interest of our national economy — generally. Acceptance of this stewardship is acceptance, also, of the belief that, in the long run, no industry, and no unit of industry, that does not serve society can live.

Have the actions of management caused the times to change? Or has an alert management been successful only because it has changed with the times? Certainly, the industrial concern of 1900 would not thrive under the conditions of today. Just as certainly the new things that industry has in store for a waiting postwar world will have a far-reaching effect upon the times.

Management today seldom owns the factory or the business it manages. It is hired to perform the coordinating, directive functions. It is free to change — of itself, or with the times. Management therefore exercises its power through leadership in executing ideas . . . not through ownership.

Good management can be sustained only in an environment sympathetic to its aims. It has an undeniable obligation to society, because it must be a compatible part of the social structure or be rejected by that structure as a whole.

An environment sympathetic to its aims means, also, that industry, in the very serious reconstruction period ahead, will not be at full effectiveness if it is subjected to attacks by government no matter what the underlying reasons may be — over-zealous devotion to a cause, lack of understanding or just plain politics. It was to industry — to industrial management — that the government turned when our existence as a free nation was threatened; it is to industrial management that government must turn in order to win the peace.

This statement is made in the sincere conviction that what has made America strong is industry's ability to produce consistently more and more goods and services for more and more people. It is only by actually creating them that we built up our stockpiles of the necessities of life. And it is only by creating them that we can have more of those things that make life worth while. These become available to more people as industry succeeds in getting greater output of goods and services for a given input of human energy, materials and power.

And what of the physical jobs ahead? In this country alone, there will be an immense demand upon industry to supply the things people have been unable to purchase during the war. Today the nation is wearing out not only its automobiles, refrigerators, vacuum cleaners and radios, but its very houses, its roads, railroads, and airline equipment. It is saving its money while whetting its appetite. Truly, the calls the American people will make upon industry in the postwar period will be many and insistent.

This demand can be viewed in another light. Economists say there will be 56,000,000 persons seeking gainful employment after the war. The Committee for Economic Development has estimated that \$140,000,000,000 worth of goods and services will be required each year for those people. Compare that with

our actual output of \$97,000,000,000 worth of goods and services in 1940 when gainful employment was 46,000,000.

These future jobs will be done if industry's management is not too much hampered by government management. Management in industry performs its function in the field of doing things. Management in government performs its function in the field of regulating things. The best cooperation of the two kinds of management will be necessary in the postwar period. Certainly, too much of the regulatory kind will interfere seriously with the kind that does things.

Industrial management must improve, too. If it is too selfish, if it does not recognize definitely the trusteeship inherent in its job, if it does not understand and live up to its social responsibilities, then it will be risking all for which we are fighting. The following suggestions are made to indicate the direction that management's self-improvement can take.

Evolution in management has been too slow in some respects. Management in industry has been too prone to see the advantages in technological development while being blind to its evils. Looking at industry and social progress as a whole, there can be no doubt as to the value of technological improvement. It creates jobs. It elevates the standard of living. But that economic fact is of no satisfaction to the individual who loses his job because a new machine or a new method required one less man. By and large, this is an evil that management can do something about.

Management has been too careless of its opportunities with

regard to labor. On that account the pendulum of social readjustment has swung too far. Labor has been given extensive privilege without corresponding responsibility.

Industrial management has been too slow to abandon its policy of letting the buyer beware. As a result of this, industry today is over-regulated.

Management has been too slow in recognizing its responsibility to promote the economic philosophy that a society cannot have for consumption what it does not produce. A companion educational item too long neglected is management's obligation in the field of public relations.

In these years since 1900, industrial management has been growing. Perhaps many of its experiences have been but growing pains. Management has learned, among other things, the absolutely vital need for capital at the right time and in the right amount. It has learned to use some of its earnings as "seed-money" in the introduction of new products and the use of new processes. It has learned to invest more and more in research. It has learned of the interdependence of industry and agriculture. And it has learned much about the eternal triangle of industry, labor and government.

With such a history and such experiences behind it, I have every faith that management is going ahead to even more glorious accomplishments in the winning of the war, and I believe that its peacetime accomplishments to come are beyond the prediction of any of us — even management itself.

*This is the fourteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.*

*James H. McGraw, Jr.*

President, McGraw-Hill Publishing Company, Inc.

# Electrical Contracting

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## HOLD TOP PRODUCTION

Cutbacks in certain munitions programs in recent weeks have been misinterpreted as the beginning of a breathing spell, when industry can take it a little easier and the workers can lay off for a few days now and then. The idea is getting around that the stuff is vital, sure enough, but a day or two one way or the other isn't going to hurt the war program. That's wrong—dangerously wrong.

The overall production program is, as a matter of fact, still rising. It may flatten out about October of this year. In the meanwhile, the schedule reductions in certain lines are evidence only of changing emphasis or an adjustment to "breaks" at the fighting fronts that could never have been anticipated. Experience has reduced the importance, for instance, of certain tanks, of certain guns, of certain types of field equipment. It has also changed replacement estimates.

In the total picture, however, the needs for production speed and efficiency are greater than ever. This point needs particular emphasis in construction. The cutback of projects has severely reduced new business opportunities in the building industry, and, after the usual time lag, will undoubtedly be felt in electrical work. There is a natural and logical reaction. Why, as a contractor, beat your brains out to finish the job where there is no urgent project waiting to use your organization? Why, as a labor leader, waive working rules and

put the heat under the boys when the travelers are already coming home?

However unpatriotic it may be to ask such questions, they are there by their own logic. Yet we all know that present construction projects must be finished on schedule. A 100 octane plant, for instance, may come at the tail end of the overall facilities program but planes now coming off the lines need the gas from that plant. Curtailed facilities only aggravate the essential and immediate needs for the products of the plants under construction today.

The real answer is to keep the heat on by holding the construction industry at top production. In electrical construction especially we have developed highly efficient and capable organizations staffed with men of extraordinary experience and knowledge. There is still a vast job to be done to improve our industrial facilities for making war, to patch up electrical systems in everyday commerce and to give war workers something approaching decent living quarters. This is an immediate and essential job for the effective prosecution of the war. It needs no grandiose planning. All it needs is enough materials and fair recognition in the scheme of total war.

*Wm. J. Stuart*

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AUGUST, 1943



## A SCHEDULED FLOW OF MATERIALS

helps this contractor keep his dates

An electrical contractor working on war projects has completed four important jobs . . . all ahead of time, winning the commendation of the Army Engineer Corps. An important factor in his success: "waits" for materials never impeded the work.

Scheduled deliveries, via GRAYBAR,

helped get material to the job as it was needed, without advance stockpiling and storage at the job site. Products that "went together" in construction arrived together just prior to their installation.

To assure this scheduled flow, this contractor and his local GRAYBAR rep-

resentative worked together well in advance, setting up an orderly delivery plan for supplying "everything electrical." GRAYBAR was kept fully informed of progress. Most emergency shortages were avoided by foresight all along the line. On a few occasions, alternate materials from convenient GRAYBAR stocks helped fill the gaps.

### Serving as your MATERIALS MOBILIZER

Your own electrical needs can be satisfactorily met by close cooperation with GRAYBAR in planning a scheduled flow of materials to your war job. The MM Plan "dovetails" GRAYBAR's procurement work with your own purchasing requirements. You save time in getting estimates, checking specifications, expediting delivery, locating "hard-to-get" items. Ask your local GRAYBAR Representative how this "one-call" service can help you.

Executive Offices: GRAYBAR BUILDING, New York, N. Y.

# GraybaR

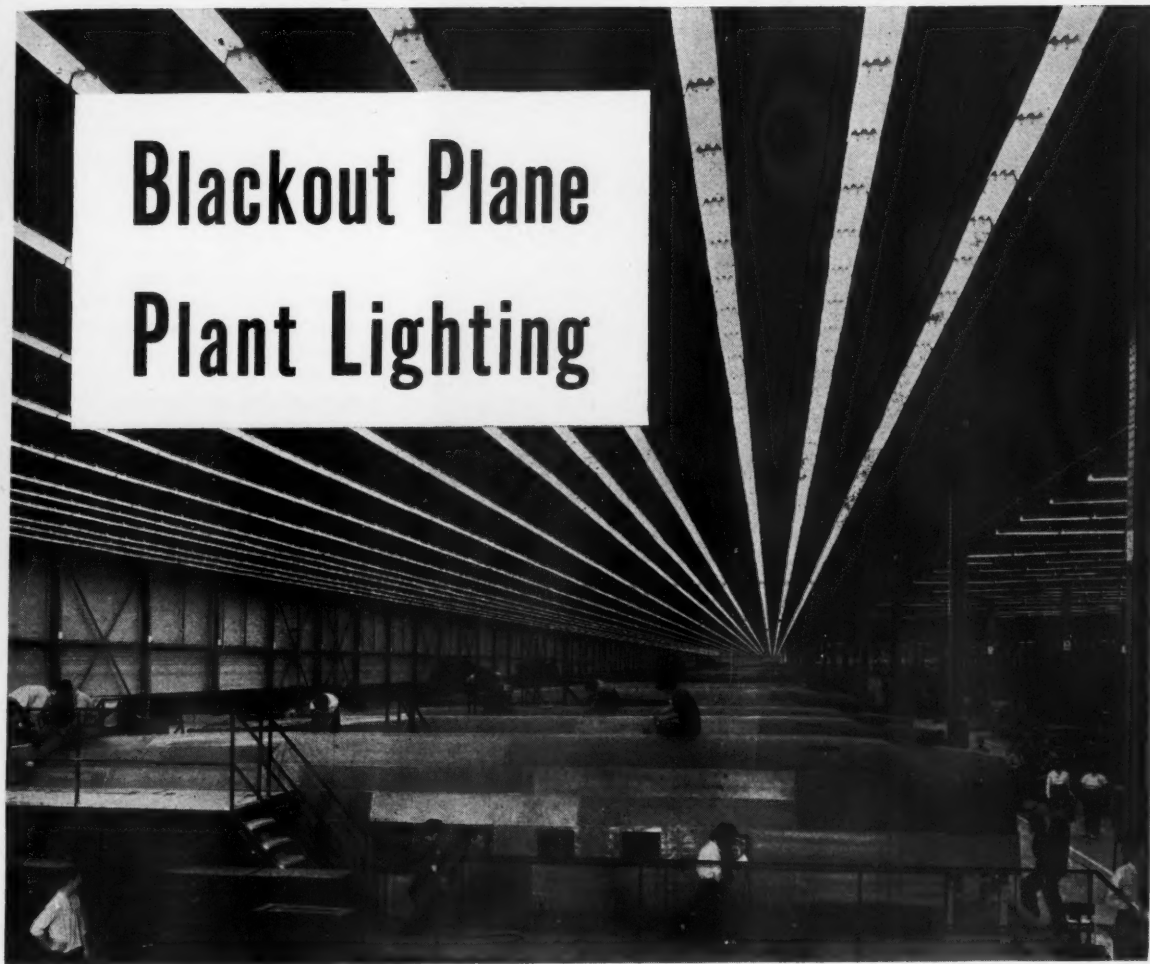
IN OVER 80 PRINCIPAL CITIES





ELEVEN MILES of continuous troffer fluorescent lighting combines with light reflecting ceiling, walls and floor to produce better than 55 foot-candles of illumination in this main assembly area.

## Blackout Plane Plant Lighting



Carefully engineered fluorescent lighting bathes this southwestern windowless plant with cool high intensity illumination. Design features cut use of critical materials.

**L**IGHTING and air conditioning play a vital part in the design of every modern war plant of the windowless type. The Austin Company, Cleveland, Ohio, was the architect-engineer-manager for one of the first "controlled conditions" plant to face rising shortage of critical materials. It was built under the direct supervision of the United States Army Engineers and is being operated by the Douglas Aircraft Company, Inc.

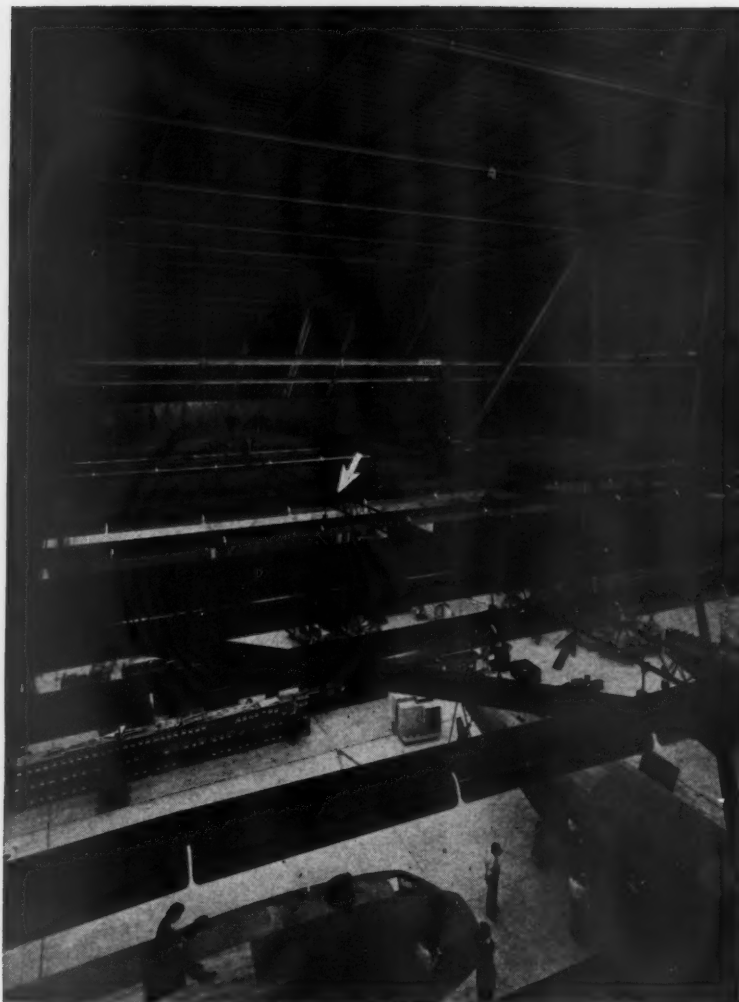
First conservation steps were taken in the building design itself. Instead of using Fiberglas and steel, 50-ft. high brick walls with hollow tile ventilating

flues were designed. These flues, perforated in the back, allow a 4-inch blanket of rock wool in the wall to "breathe," thus preventing condensation. The wool is held in place by numerous light-weight, trussed wall ties which hold the many layers of the wall together making it shatter-proof. To conserve additional steel, the assembly bays were reduced from conventional 200-ft. width to 150 feet.

Reduction of bay width required a carefully designed lighting system, since high level illumination had to be maintained right up to the walls to permit maximum use of all available floor

space. This need was met by the adoption of continuous fluorescent troffer lighting, with 16 parallel rows of units extending the length of the main assembly bay without a single break in continuity. By varying the spacing of the rows from 6 ft. 6 in., near the sidewalls to 12 ft. in the center of the bay, the light loss along the walls was overcome and a uniform level of illumination provided throughout the entire area. Light intensities were enhanced by the installation of light-reflecting Fiberglas as the insulating and sound absorbing medium on the underside of the roof and the use of white cement floors having a reflection factor of approximately 44 percent. This was particularly advantageous since a considerable amount of work is

\*From a paper presented by C. F. Prideaux, Electrical Engineer, the Austin Company, before joint meeting of the AIEE and IES in Cleveland.



BAR JOISTS mounted on top of monorail beams support the parallel rows of fluorescent troffers (see arrows). Short rod suspensions go from joists to fixture channels. (Above)

LIGHTING PANELS controlled by master contactors are mounted one foot below 1000-ampere, 440/254-volt feeder duct up in the truss catwalk. Short panel feeds and home runs save conduit and wire. Contactor push buttons are at floor work level. Note light-reflecting Fibreglas insulation on non-masonry sidewall. (Right)

done on the underside of plane wing sections, fuselages and other large sub-assemblies.

Mounting heights varied from 25 ft. in the storage areas to 35 ft. in the manufacturing and assembly areas. The foot-candle intensities in the various areas are: storage, 20; processing, 35; manufacturing, subassembly and main assembly areas, 55.

Approximately 200 tons of steel, copper and aluminum were saved by cutting the use of critical materials in the lighting units. Each fixture unit, mounted end to end to form the continuous row, is equipped with two 100-watt fluorescent

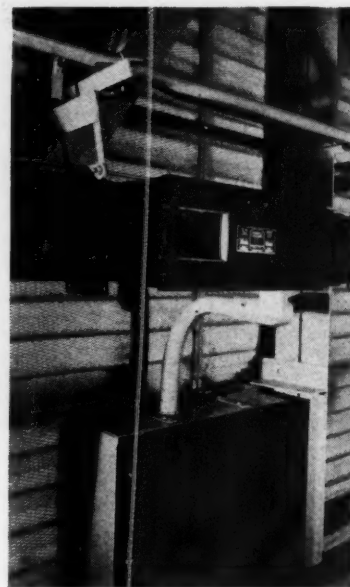
lamps and a "masonite" reflector. One 4-lamp, high power factor, 254-volt ballast serves two fixtures.

Since rows of units in the assembly area run the full length of the building parallel to and between monorail beams, the problem of rigid support arose. This was solved by using bar joists running at right angles to and supported from the top of the monorail beams. Short rod suspensions from these joists support the rows of units.

The entire lighting and power system, installed by Fishback and Moore, New York electrical contractors, is served by a 440/254-volt, 3-phase, 4-wire second-

ary bus duct distribution system. This is located up in the trusses and along a service catwalk to eliminate all overhead obstructions in the assembly area. The duct, which runs the full length of the plant parallel to the lighting troffers, is supported by specially designed trapeze hangers welded to angle iron arms extending beyond the steel columns.

Since the lighting system operates on 254 volts, numerous identical lighting panels are fed direct from the duct. They are mounted at 150-ft. intervals up in the catwalk, approximately one foot below the feeder duct. This feature reduces the length of the panel feeds to the barest minimum, shortens the home runs of the lighting circuits and permits the use of No. 12 SNA wire on all but panel feeds. The continuous fixture channels carry most of the branch circuit wiring and emergency circuits, restricting conduit primarily to home runs. Lighting is sec-



tionally controlled by master contactors located in these panels and actuated by pushbuttons conveniently located at working levels.

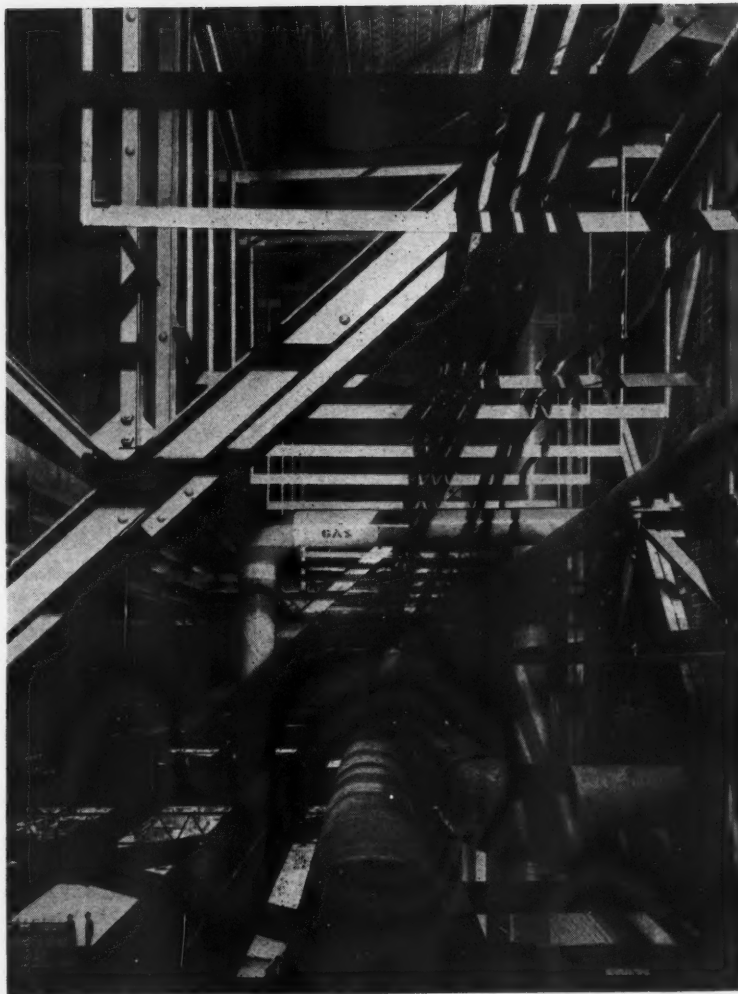
The source of the emergency lighting system comprises two 200 kw., fly-wheel type, 4160-volt, 3-phase generators on the shaft of Diesel driven air compressors. An automatic switch-gear cuts out the compressors and throws the generators on the line in case of a power failure. Emergency units, providing 16th foot-candle of incandescent illumination throughout the plant, can be lighted within 2½ seconds after a power failure occurs.

Another interesting feature is the lighting of an isolated paint shop which has an average of better than 45 foot-candles over an area of some 22,500 square feet. Sixteen 3000-watt mercury lamps, fitted with prismatic glass reflectors, are mounted at a height of 35 feet, each in a 2-ft. by 5-ft. skylight equipped with shatter-proof glass plates. All wiring from the 440-volt, 3-phase system is located above the explosion-proof ceiling of the paint shop.

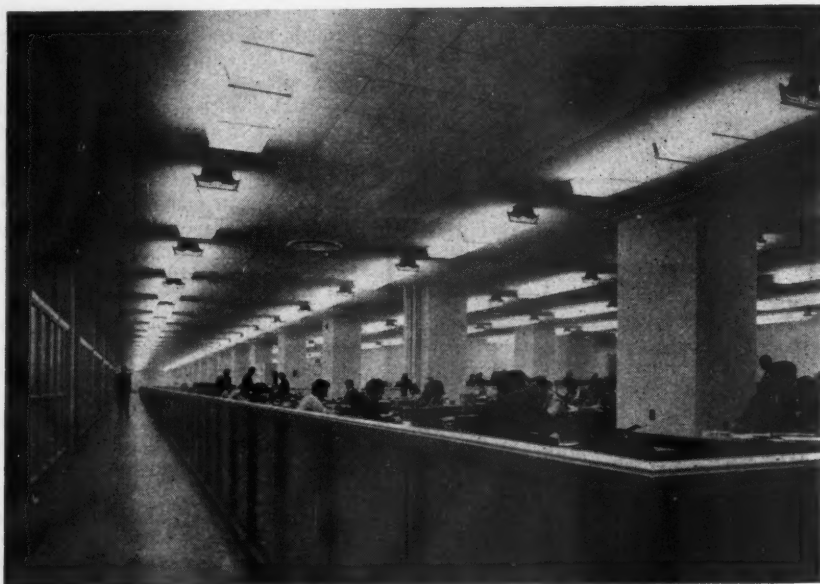
#### Reflecting Walls

The large masonry walls required a special paint suited to the particular type of native brick used. This was found in a special wax-fortified material which gave the walls a high light reflectivity and a resistance to dust. Walls were painted a May green color above a dark apple green dado. This blending of lighting and paint was carried throughout the administration building where fluorescent lighting combined with bud green walls and partitions, mottled tan asphalt tile floor and neutral color acoustic ceiling to provide a minimum of 40 foot-candles of well diffused and comfortable illumination throughout the area.

Lighting in this plant has been specifically designed to complement other controlled conditions including ventilation and complete air conditioning to obtain the ultimate in production efficiencies under excellent working conditions—so vital to the fulfillment of wartime manufacturing schedules and obligations in these times.



PRIMARY FEEDERS of 4160-volt, multiple conductor armored cable, mounted on special supports, are concentrated with other distribution systems up in trusses. Cable was installed in lengths up to 900 feet without splices. (Above)



OFFICE LIGHTING of minimum 40 foot-candle intensity is provided by 4-lamp fluorescent units blending with bud green walls and partitions, mottled tan asphalt tile floors and neutral acoustic ceilings. (Left)





AGITATOR DRIVE, each of two 5 horsepower Westinghouse gearmotors drives a pair of agitators in the pickle vats. In the background are the bate tanks, where agitators are driven by similar types of motors.

**F**ORESIGHT as to the industrial and commercial future of the leather industry coupled with advanced engineering and design, resulted in a new and completely different building and processing layout for the South San Francisco, Calif., tannery of Poetsch & Peterson recently when all operations were streamlined and electrified and all controls centralized. Louis Stockmeir, Industrial Consultant, and Jay M. Smith, Mechanical Engineer, both of San Francisco, collaborated in designing the new plant and installing equipment.

The new plant was completed with the use of minimum of strategic materials. Framework of the building is of wood, which has the dual advantage of conserving steel and resisting moisture and acids inherent in the processing

## MODERN TANNERY

operations. Concrete foundations, floors and stationary tanks and vats further reduce the need for critical steel.

At the outset the engineers determined a course of plant construction that would save needed war materials. These aims were: 1. The use of concrete and wood to eliminate steel framework; 2. The use of individual drives and gearmotors to eliminate overhead belts, line shafts and pulleys, hence decrease industrial hazard; 3. The use of 440 volts instead of the usual 220 volts, enabling the saving of copper wiring.

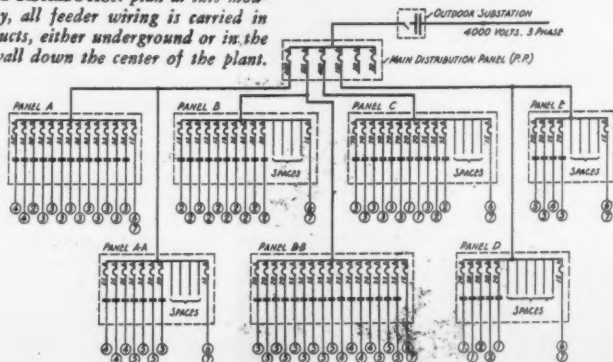
The fullest possible use is made of electricity and modern electrical appa-

ratus. Atlas Electric & Engineering Co., San Francisco electrical contractors, wired and installed the electrical equipment.

Housed in a long rectangular building entirely on one floor level, the plant is divided by a brick firewall which runs lengthwise down the center. This affords complete physical separation of the wet and dry processes and enables a straight line movement of material through the entire process from raw hides to finished products ready for shipment. Raw hides enter at one end of the "wet" side from a hide storage room and proceed down the entire length of the "wet" side through soak and wash vats, fleshers, lime vats, de-hair, bate and pickle vats, tanning drums, wringers, splitters, shavers, color drums, and again through wringers. Then the product is transferred to the "dry" side and travels back in the reverse direction through setting-out machines, progressive dryers, toggling dryers, buffers, sanders, stakers, finishing tables, and then through measuring, grading and sorting departments. The end of the trip is the shipping room, which is in the same end of the building as the point of entry.

By the time this material has made its complete round trip it has passed through a number of ingenious proc-

ELECTRICAL DISTRIBUTION plan at this modern tannery, all feeder wiring is carried in Transite ducts, either underground or in the dividing wall down the center of the plant.





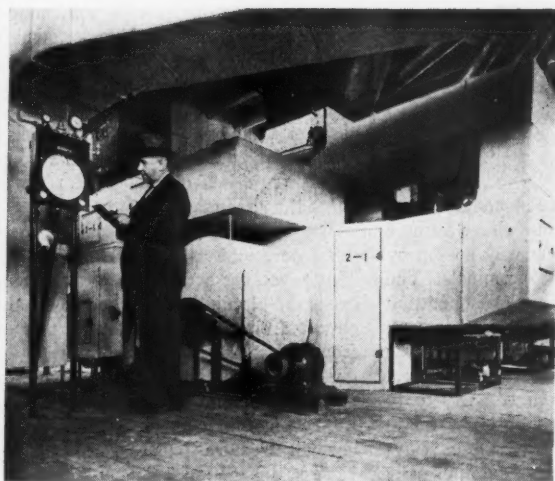
FIRST STAGE in tanning hides, the paddle type agitators are rotated by a 5 horsepower gearmotor connected to enclosed chain drive.

In this West Coast tannery all operations were streamlined and electrified and all controls centralized, making it one of the most modern leather plants in the country.

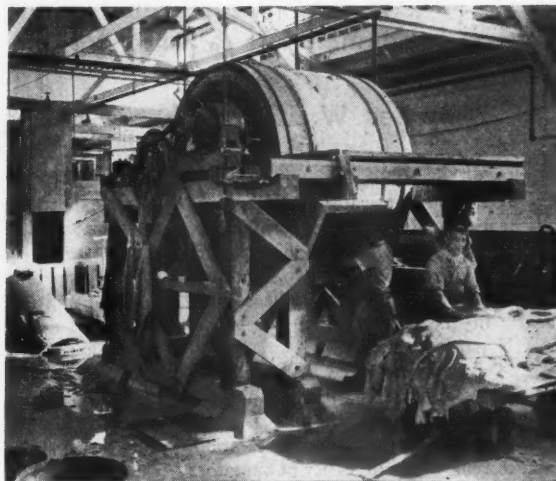
By  
**James O. Turner,**

*Electrical Engineer*  
Westinghouse Electric & Manufacturing Co.  
San Francisco, Calif.

# ELECTRIFICATION



AIR SYSTEM, Louis Stockmeir, industrial consultant, is shown checking controls of the forced air system.



FINAL WASHING. The drum is rotated by a 10 horsepower motor which drives a chain and sprocket reduction gear.

esses and devices, some of which are considered revolutionary to accepted tannery practice. Every major processing machine has an individual motor drive. These motors are of splash-proof construction so that each may be directly connected to its driven machine without suffering possible damage from water and chemicals. All motors are of the modern full voltage starting type. Those which drive slow speed machines are

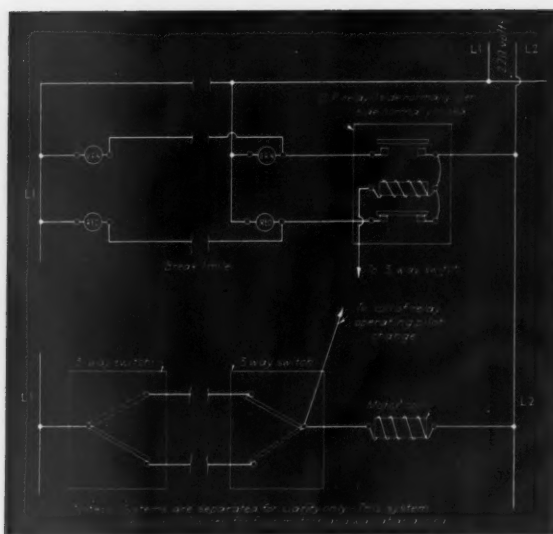
gearmotors, with motor and reduction gearing all built into a compact unit, thereby eliminating the need for belts, pulleys, shafts, bearings, and exposed gearing.

The drive for each of the six tanning drums consists of a 25 horsepower full voltage starting motor, equipped with a magnetic brake and magnetic linestarter, with the control station near the operator's hand. These controls consist of

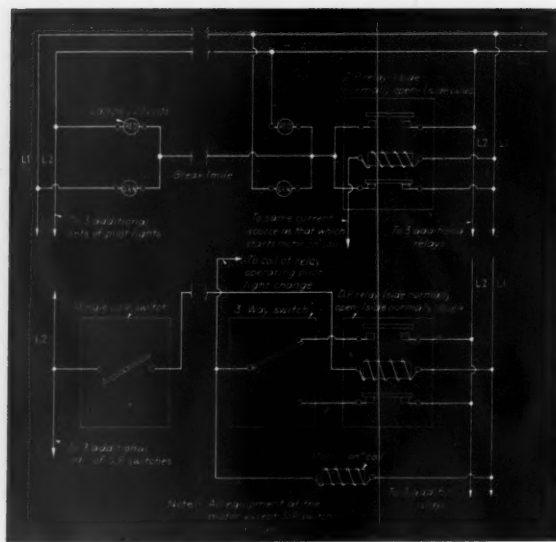
start, stop and inching pushbuttons. This system provides effortless and exact positioning of the doors of the tanning drums for loading and unloading. The drums are so positioned that doors may be opened and contents dumped to the floor level after tanning operation entirely by automatic control.

One of the most advanced innovations

[Continued on page 71]



CONVENTIONAL CIRCUIT showing a typical set of connections. The full hook-up required 17 wires on the control lines.



ADDED RELAYS and circuit changes reduced the control hook-up to 10 wires for the same number of motors.

# Relays Save Copper

Relays in control circuits reduce the strategic materials required for the system

By Leo W. Witz Continental Electrical Construction Co. Chicago, Illinois

**T**HE 2300-volt water pumping system at a Middle West Army camp, required that four 125 h.p. motors be operated from either of two locations; at the motor location or at the control board in the filter building, approximately one mile distant.

The system employed a maintained contact "stop-start" station, the purpose of which was to start the motors automatically after a current restoration, and to remove the necessity of operators manually starting each motor after a current failure. This would relate to an absolute failure only, as under voltage release would break the circuit on a gradual failure.

The usual system for the control of the four motors and the pilot lights use 17 wires, four relays and provides one common wire to the control panel, two "travellers" between each pair of three way switches, and one wire for each red or green pilot light. This is amplified by the accompanying diagram. The "stop-start" station which was used had

multiple open and closed contacts and could be transformed into either a single pole, three way or four way switch by using jumpers on the terminals. The diagram indicates the type of operation which was desired using this equipment.

The quantity of wires between the motor location and the filter control board was reduced from 17 wires to 10 wires by the insertion of eight relays into the system. Each of these relays was identical, having one side normally open and one side normally closed with a reversing action taking place when the 220 volt coil is energized. Although the pilot lights are mounted on the "stop-start" station, they are not integral and the systems controlling the pilot lights are separate and distinct from the motor control system.

One terminal of each pilot light in one set is "jumped" to its mate. From the other terminal of the "red" a connection is extended to L2. From the other terminal of the "green" a connection is extended to L1. This portion of

the circuit is a straight series connection from L1 to L2 through the lamp filaments. If either L1 or L2 is connected to the common jumper between the pilots, however, there will be a completed 220 volt circuit, either from L1 to L2 or the reverse, based upon which is connected to one side of both lamps.

The relay also has a jumper, which converts it into a three way automatic switch. One side is fed by L1 and the other by L2. When it is in a normal position the closed circuit in the relay extends L1 to the pilots and the complete circuit is from L1 to L2 which lights the red indicating light.

The coil of the relay becomes energized only when the motor is running. This reversing action in the relay now opens the circuit from L1 and closes the circuit from L2. The circuit now is from L2 to L1 which illuminates the green light and indicates the motor is running. All pilot lamps are 220 volts.

The motor control circuit would normally require 2 three way switches. To get this action using a single pole switch at the control board, a relay was inserted into the circuit. All switched wires, etc., are taken from L2 only. The relay has both circuits taken from L2, which in essence, is the same as a jumper. The only operation of the single pole switch is to energize or de-energize the "three way" relay. The net result is exactly the same as a pair of three way toggle switches.

The revised system saved approximately seven miles of No. 10 wire, 30 cross arms, braces and hardware, and 210 insulators.

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# PAY AS YOU GO

Details of the income tax plan as it applies to electrical contractors.

By Arthur Roberts

**T**HE current tax payment Act of 1943, popularly known as the "Pay-as-you-go" income tax law, does not impose new taxes on individuals but provides for the collection of tax on income as earned and designates the proper procedure. The benefits of this Act are limited to individuals, not to estates, trusts or corporations.

This Act concerns withholdings from wages of employees, hence, the employer becomes a temporary collector of the tax for the government and this complicates payroll work. Numerous new sections have been added to cover payroll withholdings and about all we can say is that this legislation means a bigger payroll job. All existing provisions for figuring taxable net income remain the same. The new Act relates solely to the method of payment and collection of tax. Aside from payroll deduction, it does not touch upon any previous regulation covering an element of business operation, such as depreciation or bad debts.

Twenty per cent of wages and salaries in excess of exemptions must be withheld from the employee's pay by the employer. Tax-rate schedules with instructions are provided by the Internal Revenue Department in Circular WT, which you should read carefully, and inasmuch as payroll withholdings went into effect July 1, 1943, all employers should be familiar with the general deduction practice by now, so we shall not take up white space detailing the method of computing withholdings, but rather, discuss the features of the Act that electrical contractors have queried us about.

Wages are any form of remuneration paid; salaries, bonuses, overtime, commission on sales, percentage of profit, hourly, daily, weekly or monthly compensation paid in cash, stocks, bonds or other property. Wages paid in any other medium than cash must be computed at fair market value at the time of payment. The tax on such wages must be paid in cash and the employer and employee must see that the cash is made available. Vacation allowances, dismissal payments and deductions from the employee's pay for taxes, social security,

war bonds, etc., are wages. If an employer pays an employee's tax liability, without deducting it from his wages, under a state unemployment compensation law, the sum must be included in wages.

The Act does not specifically cover traveling and other expenses but it appears that the rule will follow that of the Victory Tax, which states that "amounts paid or reimbursements made to employees specifically for traveling or other expenses incurred in the business of the employer", are not subject to withholding. In certain cases, there may be doubt as to whether an individual is an employee or not and this must be determined by an appraisal of the relationship. Generally, an employee is subject to the will and control of an employer, not only as to what shall be done but how it shall be done. The right to discharge is also an important factor, indicating that the person possessing that right is an employer. An employer may be an individual, a corporation, a partnership, trust, estate, joint-stock company, association or other unincorporated group.

## Computing Tax

There are two methods of computing the withholding tax, the "exact percentage calculation", or "prescribed percentage rate", as Circular WT describes it, and the "wage bracket" method. The employer may use either one, and he may exercise this option between one employee and another, using one method for one employee, the other method for the next. Wages may be computed to the nearest dollar under the "exact percentage calculation", when figuring the amount to be withheld, but this provision is new and apparently does not apply if the wage payment is an even half dollar, say \$31.50. If wages are rounded off, a fractional part of a cent may be disregarded in the tax computation unless it is  $\frac{1}{2}$  cent or more. The employer must collect 20 percent of the excess of each wage payment over

the "family status withholding exemption", as listed in a table, which is part of the law. The contractor should have a copy of this law on hand to make sure his withholdings are correct. The 20 percent figure includes 3 percent net Victory Tax and 17 percent, calculated to approximate the normal tax yield of 6 percent and the first bracket surtax of 13 per cent on wages.

The withholding exemption is determined by reference to the employee's payroll period (the period for which a payment of wages is ordinarily made), without regard to the time the employee works during the period and without regard to the basis of computing compensation. The same rule applies whether the "exact percentage calculation" or "wage bracket" method is used. For example, an employer has a bi-weekly payroll period. An employee, single with no dependents, whose wages are determined on an hourly basis, works 16 hours and earns \$24 during the bi-weekly period. The withholding exemption will be that for the bi-weekly period (\$24 is the minimum) and no withholding is required. A schedule showing withholding exemptions by payroll periods is given in the law. Where payments additional to wages are made, prior regulations decreed that only one withholding was allowed for the total payment, and this rule would apply, for example, to a salesman paid a salary plus a commission on sales, a mechanic paid a specific hourly rate with a bonus for output where the payroll period is weekly, an office worker paid a fixed wage plus time and a half for overtime during the period.

Under the "wage bracket" method, the government supplies five tables, weekly, bi-weekly, semimonthly, monthly and daily or miscellaneous payroll periods. These tables are part of the law. A "miscellaneous payroll period", not defined under the Victory Tax, means a payroll period other than those just mentioned. If the employer, for example, pays every 10 days, that is a "miscellaneous payroll period". The tax withheld under the "wage bracket" method is a single sum corresponding

[Continued on page 125]

# WOMEN WIRE LIBERTY SHIPS



No. 1

No. 2

No. 3



Women electricians are doing all types of electrical wiring and maintenance work at the Oregon Shipbuilding Corporation in Portland. They now have 138 women doing the Marine electrical work and 54 women in the electrical maintenance department. Most of the girls took training in electrical work at one of the National Defense Workers Training schools and many hold journeymen electrician ratings. They assemble the lights and handle maintenance and temporary wiring.



No. 4

No. 5

No. 6

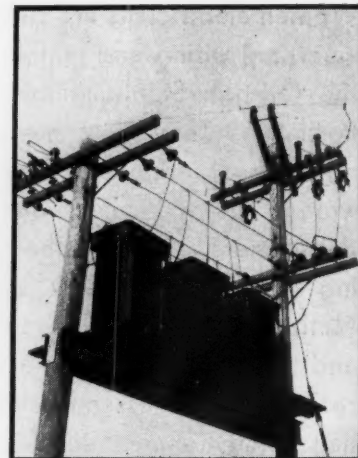


- 1 WOMEN prepare the navigating lights for Liberty ships at assembly benches.
- 2 ASSEMBLING a distribution box for one of the ship's wiring systems.
- 3 MUCH OF THE maintenance and temporary wiring installed and removed as the ships are built is done by women.
- 4 STRIPPING the jacket from a flexible cord. Note the handy tape holder on the heavy belt.
- 5 WOMEN now do any ship wiring job the foreman hands them. This electrician is installing battle phone jack boxes in the ship's wheelhouse. Note the tool kit.
- 6 THE MAZE OF WIRES, switches and electrical controls in the ship's wheelhouse are all part of the day's work to the lady electrician's crew. They are installing wiring for a compass compensating control box.





RECTIFIER TRANSFORMER is fenced in; rectifier and control are enclosed in steel housing and station power transformers hang on pole above the housing. D.C. line and bore-hole can be seen in foreground. Power supply transformers are in background.



POWER SUPPLY TRANSFORMERS are mounted on platform between two wood poles and supported by two lengths of channel iron.

## IGNITRON D.C. SUBSTATIONS

**H**OUSEWIVES take for granted the convenience outlets which are distributed generously throughout the house for small blocks of power to operate their sweepers, irons, mixers, radios and lamps. Coal mine operators have been forced to seek an approximation of this same type of distribution whereby the power supply can follow upon the heels of mine operation.

Taps off the utility lines are the convenience outlets for power supply to portable d.c. mine equipment. But to reduce excessive voltage drop it becomes imperative to keep the supply substation as close to the load as possible. For this reason substation portability is a very important factor.

The whole question simmers down to a decision based upon the economics of operation. Should money be spent for a shutdown to move the equipment or will it be cheaper to permit the excessive voltage drop with the consequent loss of power and more costly operation at reduced voltage?

The Pittsburgh Coal Company at their Euclid Mine, West Newton, Pa., has installed a sealed ignitron d.c. surface substation that can be disconnected and dismantled, trucked to the new location, set up, reconnected and ready for operation in one 24 hour day.

John E. Roblee, electrical engineer

**Small blocks of d.c. power in portable units used in coal mine operation show electronics at work.**

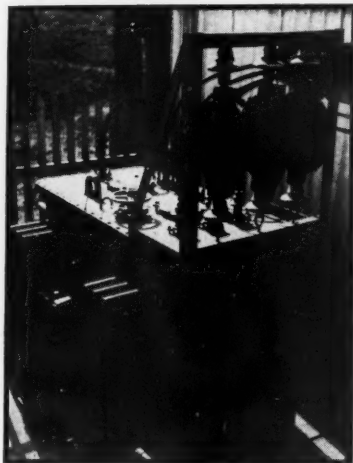
and his assistant, A. B. Cunningham reserved the portability of power supply equipment as the primary consideration in the over-all plan of their substation layout and design.

Originally, two 150 kw. motor-generator sets at the entrance of the mine supplied the power for equipment operation. However as the mine progressed and supply lines became extended, voltage drop became excessive and unsatisfactory operation resulted. A sealed ignitron unit was purchased from Westinghouse and spotted in the direction of progress beyond the point of present operation from the entrance substation. By paralleling the feeders, the two substations are now sharing the load and utilization voltages are very easily maintained at rated value. As an interesting side light, immediately after the new substation had been interconnected with the old, the insulation on several trailing cables broke down and went to ground.

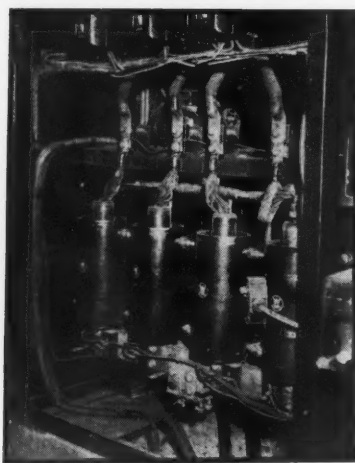
This trouble was due to "endosmosis" or "electric osmosis," that is moisture will tend to collect around a negative conductor more than the positive one,

thus decreasing the negative conductors resistance to ground. Due to the rectifiers construction it was found desirable to make the ground positive and the trolley negative. The trolley cable which had previously been comparatively dry now collected moisture and failed at its weak points. The effect was given emphasis due to the fact all the trouble occurred within a short time. However, cable maintenance at negative trolley mines is not greatly different than at positive trolley mines.

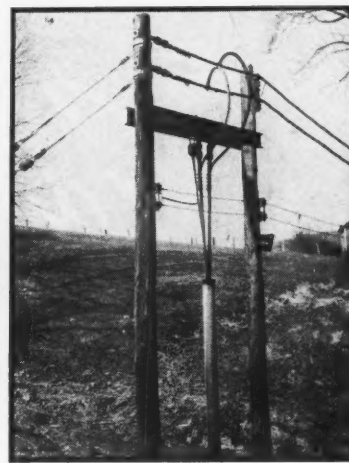
The utility furnishes 2,300 volts from a 6,900 volt line with three 150 kva. transformers. Seven hundred volt a.c. power is furnished to the four ignitron tubes for conversion to 575 volts d.c. Originally, an electronic voltage regulator gave unsatisfactory voltage regulation, but the application of a Silverstat regulator has solved the problem, and now extremely close regulation is obtained above 10 percent load. Three choke coils are placed in series in each phase of the 2,300 volt primary for reduction of communication interference. The rectifier transformer is of the outdoor type as is the oil circuit breaker,



CHOKO COILS are mounted directly on top of the rectifier transformer and are connected in series with each leg.



SEALED TUBE IGNITRONS four in number are located at bottom of rectifier cabinet. Power cables are of 600-volt parkway type.



DIRECT CURRENT CABLES 2,500,000 cm are shown dropping from the structure into the 6-inch conduit which lines the bore-hole.

and both rest on a concrete base. The heat exchanger which is used for circulating cooling water through the ignitron tubes is also outdoor type. A trench is used to carry control cables and copper water tubing. Four 250,000 cir.mil cables connect the transformer to the ignitrons. To avoid using heavy bushings which would require a supporting structure, (since the rectifier housing is merely 20 gauge galvanized sheet steel) two slabs of ohmstone were drilled to accommodate the cables and are bolted together on either side of the housing wall. The 2,500,000 cir.mil., d.c. cables are of the 600 volt parkway type which is laid in a trench to the breaker and through another trench which terminates at a corner of the concrete foundation supporting the interior rectifier and control panels. The cables, which rise up a pole that sets at the corner of the housing, are carried one short span to the bore-hole where they are dropped, along with telephone communication lines, through a 6-inch conduit to the mine operating levels, and tied in with extensions from the m-g units at the mine entrance.

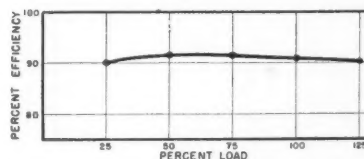
The substation is completely automatic and needs no supervision. In addition the entire system is carefully protected with relays, fuses and lightning arresters. The 6,900 volt side of the supply transformers are protected by arresters, as are both ends of the short 2,300 volt line feeding the rectifier transformer. In addition, the 575 volt d.c. feeder, which is strung overhead from the rectifier house to the bore-hole, is protected at both ends by lightning ar-

resters. The 2,300 volt oil circuit breaker is of the automatic magnetic reclosure type. The d.c. breaker is designed for operation on reverse current, under-voltage and over-current. Ignitron temperature indicator and relay contacts will disconnect load if tube temperatures run too high for any reason such as stoppage or leak of cooling water. Anti-freeze is used in the cooling system in winter. Small horseshoe magnets ring each 250,000 c.m. cable coming into the rectifier which when tested will indicate the faulty tube in event of heavy currents due to arc-backs.

Station power is provided by three kva. 2300/220 volt transformers that supply current for lighting, heat exchanger and ventilating fan motors, and all control requirements.

When the necessity arises to move the substation to a new location where concrete foundations have been laid and the bore-hole drilled, approximately 24 hours are required to dismantle, move and get back into operation. No conduit is used whatsoever. Braid is used on the lighting circuits and parkway type for power cables. It is only necessary to remove foundation bolts; mark, disconnect and coil up cables; remove the housing; disconnect tubing and the plant is ready to load on trucks for moving.

Mr. Roblee expressed great satisfaction in the ignitron substation, stating that due to it being full automatic involving no rotating equipment it requires much less supervision. In addition, he feels that the rectifiers are much more favorable to their operation, in that the efficiency of a rectifier at light



A TYPICAL EFFICIENCY load curve showing a remarkably high value at light loads as well as under heavily loaded conditions.

loads is almost as good as at full load. Most important of all though is its portability.

Use of this equipment, however, is not limited to coal mine operation. These factory built units can be applied anywhere quite economically to any industrial or commercial application where small blocks of d.c. power are required ranging from 75 kw. to 500 kw. at nominal voltages. The first cost of the ignitron rectifier is about 15 percent less than that of other types of equipment for securing d.c. power. Further, since the life of the sealed ignitron tubes are guaranteed for three years and experience indicates longer life may be expected, maintenance costs are reduced to a very reasonable figure. The tubes can be replaced for about 10 percent of the original investment. An important characteristic of this unit is its high efficiency at very light loads which should be kept in mind when comparing the various types of a.c. to d.c. generating equipment. Every application has its own kinks and limitations which generally indicate the type of equipment that should be used. Both rectifiers and m-g sets have their advantages and disadvantages to be weighed in the decision.

# Editorials

W. T. Stuart, Editor

## Synthetic Rubber For Insulations

With the rapid development of our new synthetic rubber facilities, WPB has set the stage for a changeover from the dwindling stockpile of natural rubber to the new synthetics. Along with other rubber products, rubber covered wire insulation will soon consist of various compounds of Buna S and Butyl.

To the contractor and the electrician there will be no apparent difference from the type R and RH wires already in use according to the best expert testimony we can reach. The new insulation will resemble its natural rubber counterpart in every way. Its physical characteristics will be identical and its electrical characteristics will closely approximate the equivalent natural rubber compounds.

The course of synthetic rubber research and development has been directed toward producing a product equal to natural rubber for all kinds of uses. As the chemists learn more about scrambling the molecules, however, expert synthetic products superior to natural rubber for insulating electrical conductors will be forthcoming.

## Lighting Bottlenecks

The obsolete lighting still prevalent, primarily among the smaller plants converted to war production compared with the modern new plants is one bottleneck of small plant production that is readily apparent from any train window.

These plants are in dire need of good lighting—particularly now that they are working round the clock. The

parts they are producing are vital. And both quality and quantity are important.

Have the managers of these plants ever been shown the advantages of good lighting? That such conditions do exist and that something can be done about it was recently substantiated by a survey of metal working plants in the Chicago area, conducted by several lighting engineers and sponsored by the local WPB and the Chicago Lighting Institute. Bare lamps, harsh shadows, sharp contrasts and insufficient machine and general lighting were found. Recommendations for improvement were made and conditions corrected.

An extensive survey should be made in every industrial community. The local electrical contractor could help break these lighting bottlenecks. He knows lighting practices and he can offer his services to correct improper lighting.

It is essentially an educational job. But the stakes are well worth the effort—increased production and fewer rejects for the customer; higher plant employee morale; and a nice bit of business for the contractors.

## Absenteeism and Maintenance

Absenteeism is a wartime problem that industry must face. Whether the underlying cause be sickness, domestic problems or indifference, the net result is the same—an idle machine and a production slump.

No one likes the word nor what it implies. No one condones the practice, justifiable or not. But absences can be used if an employee is absent; if he or she cannot be replaced for that day; if the machine is idle, use that

lost machine time for a profitable maintenance check-up?

One midwestern plant does just that. Since machines are operating round the clock, opportunities for preventive maintenance are at a premium. Through close cooperation with the time office, the plant maintenance engineer ascertains each day what machines, if any, will be idle because operators are absent and cannot be replaced. Maintenance men are then dispatched to give idle units a thorough check-up and to take necessary steps to prevent a future unheralded breakdown.

Such a practice lightens the shutdown, week-end or night load of the maintenance department and enables the crews to cover the entire plant more efficiently.

Absenteeism is a serious problem and should be reduced to an absolute minimum. But, whatever the degree prevalent in plants today, those idle machine hours can and should be profitably delegated to much needed maintenance.

## A Big Selling Job

Actual war production work—wiring of machine tools, planes, ships, tanks, etc.—offer an important challenge to the salesmanship of the electrical contractor.

In the production field, electrical contractors are already wiring cargo and combat vessels. This might be projected into the wiring of tanks, planes and other ordnance materiel. It is a field that deserves intensive exploration by the electrical contractor.

It's going to be a tough selling job. But, with the production race just beginning and with the manpower situation critical, the contractor has a great opportunity. He can carry the vital know-how, the skilled management technique and trained men into a new field. It is well worth doing.

## Are We Flexible?

Contractors generally are cussing the limits on metallic wiring systems for the duration. Some are hesitant about using the recommended non-metallic systems. That is understandable since the majority of them have been thoroughly schooled in metallic



system methods and do not have the manpower trained in the techniques so common a generation ago.

But the fact still remains that we are in a war and critical material shortages exist. Installation techniques must be tailored to fit the materials at hand. If we do not have men experienced in non-metallic wiring it is up to us to train them.

The Cook County Contractors Association in Chicago shows how by holding classes covering the estimating and installation techniques for non-metallic systems. Men who never before handled a knob and tube or cleat are now making such installations and doing a good job. Others are taking a crack at it. It is a splendid symptom of flexibility and ready willingness to serve the public with whatever means are available when we find contractors so receptive to old and new installation techniques and so willing to dig for information.

## Welding Code

A technical sub-committee of the Electrical Committee has proposed a new Article 630 for the Code. It tackles the installation of stationary and portable electric welders, recognizing the special problems which are involved in the wiring and protection of this kind of equipment.

The technical features of this new Article are under discussion by the industry and they are beyond the scope of this brief comment. However, the clear methodical way that the committee, headed by L. W. McCullough, presented the discussion and proposal is worthy of special note and deserves the commendation of the industry.

Committee work on Code development is difficult, exacting and usually thankless. Yet it offers an opportunity to contribute materially to industry progress.

## Public Works For Postwar

The Chamber of Commerce of the United States has long advocated the development of cities along a planned course. With postwar planning under discussion, it is now urging real preparation for future public works as an essential part of economic recon-

version and as a part of long range civic planning.

The Chamber's program deserves the enthusiastic support of every civic minded business man and the full co-operation of every element in the construction industry. Essential public work is, obviously, one of the quickest and most easily controlled methods of absorbing large labor forces and of spreading business through the national economy. It requires no complex conversion. It calls upon a vast range of special skills. And the physical planning job can muster the highest professional ability from the ranks of architects and engineers who are now bringing the war construction program to completion.

Every one of us can do something about it now. We can stimulate discussion in civic organizations, call on city, county and state engineering departments for an outline of their problems and projects and, above all, make sure that the plans consider the important progress in electrical wiring and utilization of these recent years.

## Sunday For Maintenance

Two bottlenecks in the maintenance picture is a shortage of skilled men and the reluctance of production men to shut down machinery for routine maintenance and repair. In many cases production is carried on at the rate of twenty-four hours a day, seven days a week, with no time off for employees in production or maintenance. Some production schedules call for 168 hours per week but with a staggered rotation of employees so that every seventh day is a day off for the employee. However, this gives no opening for the maintenance organization to reach equipment.

A straight six day week with two 10-hour shifts, has been suggested. That leaves Sunday off for every one—except the maintenance personnel, who may schedule their day off during the week. One full day in seven is then available for maintenance crews to catch up on their task of maintaining all equipment at top operating efficiency. To many organizations Sunday maintenance has been regular procedure, but pressure from war production has forced 168 hour weeks. However, this continuous pressure is beginning to tell on industrial equipment and Sunday maintenance may prove the only solution.

## Washington Notes

While the chief concern today in WPB circles is the problem of keeping war production schedules at top speed, there are several signs of interest in restoring the production of some civilian essentials at the earliest possible moment. There is a clear trend toward providing more repair parts, and probably, limited automobile production.

Supplies of copper are still tight, with little chance that it will relax for some time. Other metals are easier, including aluminum. The coal strike will be felt for months in steel with the loss figuring a half a million tons.

Review boards are studying war goods schedules against battle experiences. More cutbacks will come, but the armed services, aircraft and ships will take up any available slack in manpower or raw materials according to present estimates.

CMP Regulation No. 6 now provides a working plan for scheduling critical materials in construction. It works about the same as Regulation No. 1 and gives allotment numbers to the contractor for wire and cable and other criticals.

FHA sees a tremendous deferred demand for new homes, particularly in areas which have not needed large war housing projects. All postwar thinking predicts a boom in residential building as one of the first developments when material restrictions are eased.

The rubber program is well advanced. The present outlook indicates that rubber will cease to be a critical factor in war material or essential civilian production by mid 1944.

Construction put in place in May was estimated at \$1,040,000,000, according to Donald Nelson representing a drop of 6 percent from April. Industrial facilities totalled an estimated \$442,000,000 for the same month.

WPB is setting new goals for labor management committees, 5000 by January 1944. In June there were 2237 committees representing 5,505,100 workers. Consensus is that wherever established, labor-management committees have significantly improved production.

The new WPB Design Guide for wiring and lighting says "mechanical and electrical features shall be reduced to bare essentials—" but still provides for good lighting practice.

# Methods

**BRIEF ARTICLES** about practical methods of installing and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

## WELDING SILVER BUSBARS

WIRING

To release vital copper for other war needs, solid silver busbars were used extensively to feed heavy currents to magnesium cells at one of the Defense



**STARTER CABLES** are installed and connected to solid silver busbars runs over magnesium cells at Dow's Michigan plant. Silver tap-off plates are bolted to 9-in. by 1/2-in. busbars supported by insulated rods from ceiling.

Plant Corporation's newest magnesium plants in Michigan. The plant, designed and built by The Austin Company, Cleveland, Ohio, is operated by the Dow Magnesium Corporation. Hatzel-Buehler, New York electrical contractors, handled the electrical installation.

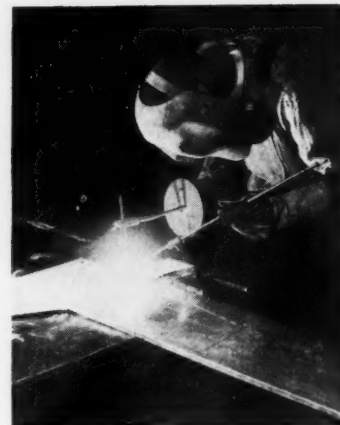
Numerous angular offsets were necessary in the design of the bus runs, some of which contained as many as nine 9-in. by 1/2-in. silver bars in parallel. To form such offsets and permit close grouping of the bars silver welding was employed. The sections to be joined were first preheated, then welded together with a silver welding rod heated by an electrode of an electric arc welder.

This arc electrode was equipped with a water-cooled handle. Welding the bars in this manner produced a strong, heavy current carrying joint capable of withstanding both mechanical and electrical stresses. Flanges for overhead insulated supporting rods were also welded to the bars in a similar manner.

Because silver is a highly precious metal and this particular lot was loaned to the DPC by the U. S. Government, the question of waste and scrap was carefully controlled. There were no left-over or scrap pieces of silver busbar, since all runs were prefabricated to rigid specifications with the necessary holes cut and drilled at the fabricating mill. Any chips or drops of silver welding rod were collected and turned back to the Treasury Department through one of the numerous Treasury guards stationed in all buildings, the fabricating shop and silver storage areas.



**FABRICATED SECTIONS** of solid silver bus are layed out to form a parallel run of bars to feed magnesium cells at Dow Magnesium Corporation's Michigan plant. Added weight of silver bars is evident from manpower needed to handle sections.



**WELDING SILVER** busbar supporting flange to a 9-in. by 1/2-in. solid silver bar, one of many installed at the magnesium cells of the Dow Magnesium Corporation's new Michigan plant. Angular offset has already been welded to straight run. Electrode in welder's right-hand has a water-cooled handle.

## METAL CURTAINS SUB FOR PARTITIONS

INDUSTRIAL

Process heat and gas elimination from manufacturing areas is a problem of air conditioning and ventilation. It is fairly simple when the area in question can be enclosed by partitions or the process can be housed in a separate building.

The modern windowless type of plant brings additional facts into consideration. First—all manufacturing processes



**CURTAIN TRAPS** of metal confine process gases to restricted areas for exhaust to outdoors and still leave floor areas open for free flow of materials in the cadmium plating department of this bomber plant.

are generally performed in the same building and under the same roof; second—partitions are not always feasible since a free flow of production must be maintained throughout the plant; and third—process gases should be confined to and eliminated from the specific area in which they are generated.

Just such a problem arose in the design of a cadmium plating department of a southwest windowless plane plant. The builders solved the problem by using special ventilating ducts and metal curtains.

Accurate control of all air currents in this and other processing sections of the plant eliminated the need for full length partitions. Special process heat and gases are trapped by metal curtains which extend from the roof to a distance of 10 to 15 feet below the bottom chord of the trusses. Fans and blowers exhaust these gases to the outside atmosphere through appropriate vents and louvers.

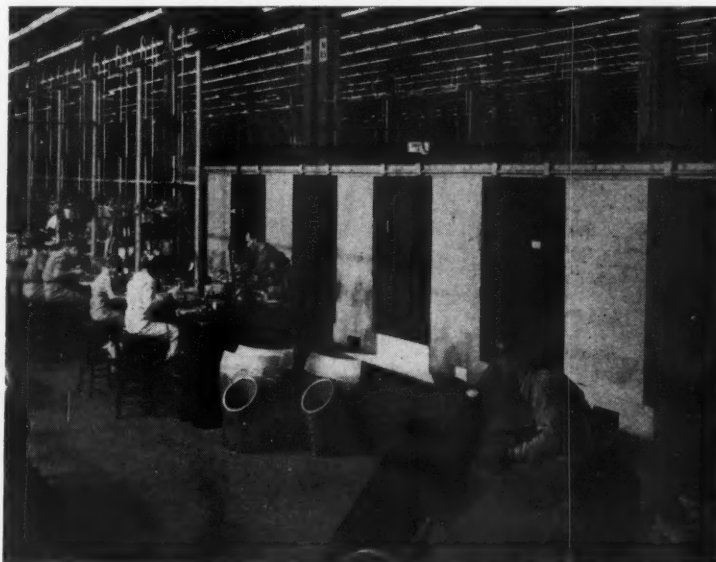
## TILE WELDING BOOTHS PROTECT EMPLOYEES

INDUSTRIAL

Taking cognizance of the fact that the ultra-violet light from an electric arc is injurious to the eyes and that the arc itself is distracting to employees in the same area, The Austin Company of Cleveland, Ohio, engineers and builders of a windowless plane plant for the Douglas Aircraft Company, Inc., in the midwest, designed separate tile booths for electric welding operations.

The booths, a group of which are shown in the attendant photograph, are constructed of light colored tile and equipped with sliding doors to shield other employees working in that area from the welding arc and metal sparks. These welding dens have air vent spaces under the doors and no ceiling, thus permitting the welding fumes to be exhausted through the circulation system.

Light for the booths is provided by the 55 foot-candle fluorescent general lighting installation, giving ample illumi-



**SPECIAL WELDING BOOTHS** of light colored tile are provided in this Douglas windowless plane plant. Employees in surrounding area are protected from ultra-violet radiation and arc flashes. General plant lighting system illuminates the tileless enclosures.

nation for the welder to perform his work in visual comfort.

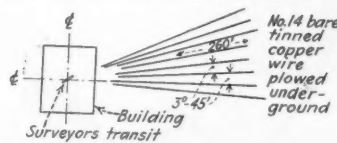
Welding current is supplied by motor-generator sets within the booths fed from a 440-volt bus duct installation immediately above the tops of the enclosures.

Designs such as this indicate the care and thought that is being given to protection and safety in welding areas. Comfortable surroundings and working conditions for both welder and non-welding employees boost morale and production.

## SPOTTING RADIAL GROUND CABLES

WIRING

The spotting of radial ground cables at 3 degree, 45 minute intervals was one of the problems that the Malko Electric Company, Chicago electrical contractors, solved on a recent coast-to-coast radio station installation. These No. 14 bare tinned copper ground cables emanated from a circular copper bus surrounding the main building and extended for a distance of 260 feet beyond the bus. Good grounding is vital



**TRANSIT SPOTS** cables at 3 degree, 45 minute intervals for a radio station ground system maze. Ground wires were then plowed under with an ordinary cable plow.

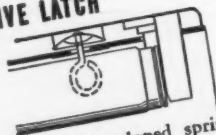


# SYLVANIA

## Challenges

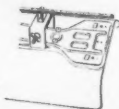


### EXCLUSIVE "CAPTIVE LATCH"



This Sylvania-developed spring-type fastener saves installation and maintenance man-hours. It stays put while lamp is in service despite any kind of vibration. It locks or unlocks with a simple quarter turn. No tools are necessary.

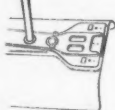
### HANG IT ANY WAY YOU WANT



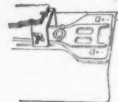
slide-grip hanger



chain mounting



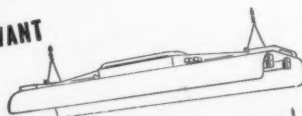
stem mounting



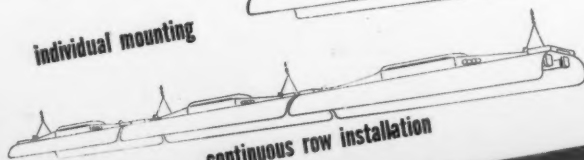
surface mounting

### AND HOWEVER YOU WANT

individual mounting



continuous row installation



### MORE LIGHT FROM LESS WEIGHT

Sylvania pioneered composition reflectors for fluorescent fixtures and "proved them in industry."

This composition reflector has an efficiency of 86 per cent — even higher than that of prewar porcelain-enameled metal in conventional contours.

It is fabricated to Sylvania's specifications from a strong and durable composition. Coated with MIRACOAT inside and a handsome French Gray outside, it stands up under extreme humidity and temperature conditions.

- ✓ Impervious to frequent washings.
- ✓ Gives more light.
- ✓ Lighter and easier to handle.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES

# Comparison

## Check these points of Superiority

- ✓ Easier installation
- ✓ Speedier maintenance
- ✓ Cantilever construction
- ✓ Simple design
- ✓ Standard interchangeable parts
- ✓ Enclosed ballasts
- ✓ Single or continuous row hanging



## *The Fixture of the Future* against the field

● Compare the design and construction of the Sylvania Fixture of the Future with any other fixture now available, and it wins hands down.

It is much more than a design to eliminate the metallic reflector and cut down top-housing weight to the three-pound requirement. Sylvania engineers attained a new standard of perfection, far ahead of its time.

A revelation of simplicity, this new Sylvania fixture is available in both 100-watt and 40-watt lamp size. In either length, *one* standard fixture fills any and all industrial lighting assignments.

Unparalleled in adaptability, it may be installed in-

dividually or in continuous rows. It is fitted with knock-outs for any practical mounting. The optional number of lamps in the regular 40-watt size gives new flexibility in meeting varying foot-candle requirements.

The streamlined top-housing, constructed like a cantilever bridge, encloses the ballast — protects it from dust — provides cooler performance. The starter sockets are honestly accessible — inset from the side to avoid dust, dirt and moisture. Pull-chain switch is optional.

The Sylvania Fixture of the Future carries Underwriters' Laboratories approval and our own standard guarantee. For specifications and prices, write Dept. EC-8, Sylvania, Ipswich, Mass.

*"Everything that's Finest in Fluorescent"*

★ ★ SYLVANIA ELECTRIC PRODUCTS, INC.  
LIGHTING DIVISION, IPSWICH, MASS.

ES AND ACCESSORIES, RADIO TUBES, ELECTRONIC DEVICES

## Methods

[FROM PAGE 49]

for radio work so accuracy in spotting the cables was important.

An ordinary surveyor's transit was used. This was spotted at the center lines of the building. With one of the center lines as a base line, the telescope was revolved at 3 degree, 45 minute increments. At each interval, stakes were spotted and driven 260 feet from the bus. A trenchlay cable plow was adapted to the smaller wire which was plowed in the ground.

### SIMPLIFIED TOOL HANDLING AND STORAGE SYSTEM

TOOLS

For each individual operation in connection with handling of production jigs, at Northern Pump Company, all drills, reamers, cutters, special chucks, bars, etc., are grouped in a wood lined container identified by the actual detail part and fixture numbers. Where size permits, the jig or fixture itself is also packed inside the box. A complete list of items normally contained is included in a card holder on the inside of the case lid. While the procedure involves duplication of standard tools the overall



**NO LOST TIME** in this system. All tools must be in box when returned to store room. This facilitates production and provides check on maintenance of all tools.



**ALL TOOLS** needed for the immediate job are located in the chest which the tool room man will issue to machine operator.

saving in time more than compensates.

Under the system, a machine operator, assigned to a new job, requisitions the fixtures needed from the tool crib, and upon delivery, the fixture, with its accompanying box of accessories, is ready for immediate use.

The operator need spend no time locating the necessary size and length of drills, reamers, cutters, etc., but may commence work without delay.

The various items contained in all stored tool boxes are maintained in perfect working condition, replacements being made from time to time as found necessary in service.

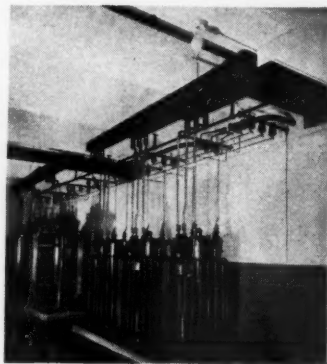
### CEILING BUSWAY REPLACES SECONDARY RACK

WIRING

Conventional floor mounted pipe racks for primary and secondary transformer buses were entirely eliminated in the transformer substations of a large Ohio defense plant. Everything was ceiling mounted—up out of the way.

Separate primary feeders entered the room for the three 1000 KVA, single-phase power transformers in the background and the three single phase lighting transformers in the foreground of the accompanying picture. These feeders terminated in primary buses of copper rod suspended by insulated supports from a ceiling mounted rack. Drops to the primary bushings of the transformers were of the same type of copper rod.

To handle the heavy secondary cur-



**PREFABRICATED OPEN BUS** of the low voltage drop type, mounted flush to ceiling columns, forms the secondary rack for this bank of power and lighting transformers. All bus connections are at ceiling height—up out of the way.

rents of both the lighting and power units, L-V-D Buss-Wa was installed on the bottom of the ceiling columns. This low voltage drop bus system is comprised of several parallel busbars per phase each encased in an insulating sheath, and mounted close together. All busbars comprising the three phases are supported in a steel channel framework of crate-like construction. In addition to permitting closer spacing of the bars, the insulating sheaths eliminate the need for steel covers thus increasing the current carrying capacity of the system.

Taps to the transformer secondaries were made with rigid solid copper bars connected to the bushings and bus offset phase extensions by adaptor lugs.

The only floor mounted equipment in this transformer room are the units themselves resting on their concrete mats.



ONLY AN ELECTRICAL WHOLESALER COULD THUS SPEED WAR PRODUCTION



## Mosquito boats roared out 52 days earlier

### *Critical Cable, Located By Wesco, Prevented Work-Stoppage—Assured On-Time Delivery*

The bad news came when the shipyard had only a few days to complete a Navy contract for small high-speed fighting craft. The manufacturer of flexible jumper cable and lugs for storage batteries essential to the flotilla, advised the shipyard—"Cannot deliver; best possible date 45-60 days." Without these small but vital parts, assembling of batteries would stop and delivery of boats on schedule become impossible.

The Navy Department called in the local Wesco house. By contacting suppliers in several cities, Wesco located a quantity of the material 750 miles away. It reached the shipyards the next afternoon. With battery equipment now complete, the shipyard was able to turn the finished vessels over to the Navy within the contract time.

On hundreds of other occasions Wesco has speeded Victory by performing small procurement prodigies leading to big production results. After the war, this service-ability will be available to business and industry everywhere.

#### WESCO SPEEDS WAR PRODUCTION

- \* An important war plant was destroyed by fire on a Friday. During Saturday and Sunday Wesco delivered a complete list of varied electrical supplies that enabled this plant to resume production on Monday morning.
- \* An air base required overnight delivery of hundreds of electrical items. Five Wesco houses pooled their stocks—made shipment by the following morning.

#### WESCO SERVES BUSINESS

- \* By providing trained sales and engineering personnel.
- \* By buying large quantities at low prices and passing the savings on to small-quantity buyers.
- \* By warehousing stocks in anticipation of customers' needs.

## Westinghouse Electric Supply Co.

150 VARICK STREET • • NEW YORK (13), N. Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES

# Out of War Plant Experience is Coming More and More Proof!

## Essential to Good Plant Lighting Are Many Types of Lighting Units

IN thousands of war plants where Benjamin Lighting Equipment is installed, the benefits of good lighting are evident daily in improved workmanship . . . increased production . . . increased safety . . . reduced spoilage . . . and high employee morale.

Experiences of war plants throughout the country demonstrate the results which are secured with the correct application of the many types of Benjamin Lighting Equipment. The list of war plants using Benjamin Lighting Equipment includes every type of plant, large and small, engaged in the manufacture of every type of product—machine guns, aircraft, ships, guns, tanks, ammunition, powder, food, chemicals, clothing and every other product used by our armed forces. A complete

list of these plants would cover many pages; only a representative list is shown below.

Further, Benjamin is furnishing large quantities of Marine Lighting Equipment, Wiring Appliances and Communication Devices for use on Navy and Merchant Marine ships.

### Benjamin Illumineering Insures Proper Lighting of the Seeing Tasks in Your Plant

Benjamin Illumineering is one of the important Benjamin contributions which is helping America's War Industries to make certain that they are securing the kind of lighting required for increased production. Benjamin Illumineering gives you the assurance that the lighting units recommended are correct in design, and are

properly selected and installed to meet the requirements of the specific seeing tasks from the viewpoint of Sufficient Light, Quality of Lighting, Light Distribution, Light Diffusion, Light Control and Shielding

### Enlist Benjamin's Experience

Benjamin Lighting Equipment and Benjamin Illumineering are available now to help you to improve the seeing conditions in your plant. Write today for a copy of the Benjamin Booklet: "PRODUCTIVE LIGHTING FOR WAR PLANTS," outlining procedure for checking lighting conditions in your plant and giving specific data on how to solve many lighting problems common to industrial operations. It will be sent to you without cost or obligation. Address Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

# BENJAMIN

Lighting Equipment

\* Among the Benjamin units being provided to war industries are those illustrated here which are, The BENJAMIN RLM DOME REFLECTOR, The BENJAMIN ELLIPTICAL ANGLE REFLECTOR, The BENJAMIN TYPE "V" FLUORESCENT LIGHTING UNIT, The BENJAMIN DUST TIGHT UNITS, and The BENJAMIN EXPLOSION-PROOF UNITS.

## These Manufacturers Know What Benjamin Good Lighting Means to War Production

Western Cartridge Company . . . Aluminum Ore Company  
Shell Oil Company, Incorporated . . . Cessna Aircraft Co.  
Granite City Steel Company . . . Monsanto Chemical Company . . . Hercules Powder Company . . . Abbott Laboratories  
Remington Arms Company, Inc. . . . Beech Aircraft Corporation . . . Allis-Chalmers Manufacturing Company  
Boeing Aircraft Company . . . Dow Chemical Company . . . General Motors Corporation . . . General Electric Company  
Columbia Steel Company . . . Jones & Laughlin Steel Corporation . . . Seattle-Tacoma Shipbuilding Corporation  
Pressed Steel Car Company . . . E. I. Du Pont de Nemours & Company . . . Union Carbide Corporation  
American Smelting and Refining Company . . . Winchester Repeating Arms Company . . . Pratt & Whitney Aircraft  
Anaconda Copper Mining Company . . . Bridgeport Brass Company . . . Worthington Pump & Machinery Corporation  
North Carolina Shipbuilding Company . . . United States Rubber Company . . . Liggett & Myers Tobacco Company  
Electric Boat Company . . . Aluminum Company of America . . . Western Electric Company, Incorporated  
Caterpillar Tractor Company . . . RCA Manufacturing Company, Inc. . . . International Business Machines Corp.  
Bendix Aviation Corporation . . . Johns-Manville Company . . . Merck & Company, Inc. . . . Bell Aircraft Corporation  
Mathieson Alkali Works . . . American Locomotive Company . . . Otis Elevator Company . . . Bethlehem Steel Company  
Douglas Aircraft Company, Inc. . . . Goodyear Tire & Rubber Company . . . National Cash Register Company  
Republic Steel Corporation . . . De Vilbiss Company . . . Willys-Overland Motors, Inc. . . . Truscon Steel Company  
Trojan Powder Company . . . Toledo Shipbuilding Company, Inc. . . . Libbey-Owens-Ford Glass Company  
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Newport News Shipbuilding & Dry Dock Co. . . . The Geometric Tool Company . . . Vought-Sikorsky Aircraft Div.

# Industrial Electrification

## WARTIME MOTORS

THE polyphase squirrel-cage motor is so popular, sturdy and reliable that we use it for almost every kind of power application. It is also so simple electrically and mechanically that it needs only a little care. Consequently with critical materials economy uppermost in design thinking, the familiar "squirrel-cage" is the motor of the hour.

There is a lot more to the application of the squirrel-cage motor, however, than its fundamental simplicity would indicate. It is important that all electrical men who live with these motors know something of the design considerations and what they mean to the efficiency and life of the motor when it is put to work.

This article reviews, in some detail, the wartime application of squirrel cage motors with particular emphasis on the operating characteristics of the widely used types A and B. It shows what each type will do and what may be expected in normal use.

Because of the relative simplicity of the squirrel-cage from the mechanical standpoint much depends on the original design and the reliability of the manufacturing process. Quality counts as much or more than in apparatus which may offer an appearance of greater complexity.

Previous articles covered—  
Electrifying Operations to Reduce Unit Costs

Safety Protection for Electrical Operations

Increasing Flexibility of Electrical Service

Electrical Aids to Automatic Control

Electrical Ways to Reduce Waste How to Save Power

Protection Against Sabotage

Improving Working Conditions

Electrifying for Continuous Operation

Electrified Plant Housekeeping

Electrical Problems Under 168 Hour Schedules

Electrical Aids to Plant Conversion

Electrical Aids to Quality Control

Electrical Aids for Green Help

Codes in Wartime

Grounding for Safety

Air Raid Restoration

Operating Replacements

Preparing for Blackouts

Wiring for Quick Changes

Power Factor Improvement

Electric Heat Speeds Production

Hydraulic Bridge Brake Maintenance

Why Use Squirrel-Cage Motors? (this issue)

ENGINEERING · INSTALLATION · MAINTENANCE

## WHY USE SQUIRREL-CAGE MOTORS?

By R. S. Bennett and E. H. Fredrick

Application Engineers, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

**U**RGENT wartime need to conserve critical materials and labor man-hours prompted the issuance of WPB's General Conservation Order L-221 covering electric motors and generators. In effect, this order pressed a more wide-spread use of the squirrel-cage motor despite its present popularity in industry. America's factories use squirrel-cage motors in more applications than any other single type of electric motor. Plants with 3-phase, 220-, 440-, or 550-volt power invariably use any one of more than 30 kinds of this simple, sturdy, trouble-free and economical motor on practically every motor application except the very special installations. Such a recommendation would have been sound advice to any motor user either in wartime or peacetime.

Why then, does the squirrel-cage motor fit this emergency picture so well? The answer is that knowing the squirrel-cage and what it can do, beyond any extent you may have realized before, is as much a good operating policy as a patriotic duty. In addition to the critical materials and man-hours saved in mass production of these units, the following advantages are passed on to the user:

1. *Delays Reduced*—through the production of standard parts and mass as-

sembly of complete  $\frac{1}{2}$  to 75 hp. cage motors.

2. *Spare Parts*—for motor repairs are readily available because of ready factory sources.

3. *Interchangeability*—standardized dimensions and electrical characteristics, long established by the National Electrical Manufacturers Association, permit every make of cage motor of the same rating to be readily interchangeable.

4. *Standardization*—by the EET and other utility bodies, has provided the proper service voltages, frequencies and phase that suit the standardized squirrel-cage motor.

As standardized as they are, cage motor types are not as thoroughly understood as they should be, and hence not fully utilized. A quick resume of their use shows that of the six standard NEMA classes, generally speaking, "A" and "B" apply to most uses. Classes "C" and "D" are for specialized applications and "E" and "F" are used infrequently, except for larger horsepower motors.

### "A" Versus "B" Motors

To assure maximum use of Classes "A" and "B" motors, it is most important to understand the outstanding differences between them. In the past, special motors, either cage or other types, have frequently been misapplied



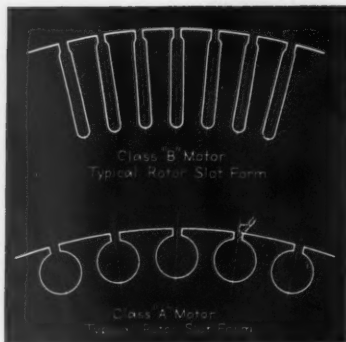


FIG. 1—ROTOR BAR cross section of typical rotor for the Class "A" and "B" squirrel-cage motors showing the deep rectangular bar commonly used in the high reactance "B" motor.

when "A" or "B" cage motors would have saved money both in purchase and maintenance. To more thoroughly understand the advantages of these types, let's review the following NEMA definitions for each:

**Class "A"**—"A normal torque, normal starting current squirrel-cage motor is a squirrel-cage induction motor with normal starting torque and low slip at rated load and may have sufficiently high starting current to require, in most cases, a compensator or resistance starter for motors above 7½ hp."

The above reference to starting current and reduced-voltage starting can be qualified. Actually, full-voltage, across-the-line starting is very common for "A" motors because distribution circuits usually have sufficient capacity to absorb the starting inrush of these units without detrimental effects.

**Class "B"**—"A normal torque, low

starting current, squirrel-cage motor is a squirrel-cage induction motor which develops normal starting torque at relatively low starting current and can be started at full voltage. The low starting current is obtained by design of motor to include inherently high reactance. The slip at rated load is relatively low."

The Class "B" definition might construe a high superiority of this type of motor because of the low current inrush and low cost of across-the-line starting equipment. However, the notation on the high reactance indicates that the low starting current advantage is relative and may be compensated for by different advantages in the "A" type. High reactance in the "B" motor is obtained by designing the rotor with deep, special-section copper bars as shown in Fig. 1. Because of this high reactance, the maximum torque of the "B" motor is decreased, although the starting torque is identical with that of the "A" motor (See speed-torque, speed-current curves in Fig. 2).

Before discussing the torque characteristics in detail let's consider the other less essential differences. The power factor difference (See Fig. 3) is important only for larger motors, or for large numbers of small motors supplied from a common circuit. Efficiencies of the two classes of motors are practically identical. From the manufacturing and availability standpoint, Class "B" motors are limited to horsepower ratings of 7½ and above (See Fig. 4). This is primarily due to the fact that below 7½ hp, "A" motors normally do not require reduced-voltage starting. The standard construction of motors in this range is of the "A" type.

One of the prime factors in the choice

of an "A" or "B" motor for any application is the short-time peak load capacity. The "A" motor has the edge in this respect since its higher maximum torque (See Fig. 2) increases its short-time load capacity.

Take for example: A drive which must deliver occasional short-time peak loads of 200 percent of full-load torque—a peak for which the starter time-delay overload relay is sufficient. At that load value the typical "A" motor (See solid straight lines—Fig. 2) will draw approximately 215 percent of rated current; the "B" motor will draw about 250 percent. Obviously the effect of short-time peak loads will be more severe on "B" motors.

The above example is typical of the

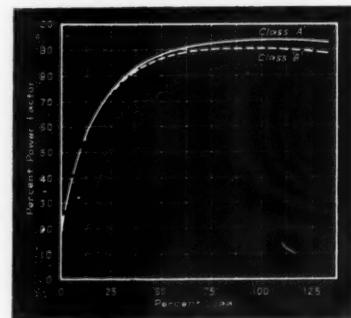


FIG. 3—POWER FACTOR CHART shows the slight variation for the larger sizes of Class "A" and "B" squirrel-cage motors.

relative difference in short-time peak load capacities of "A" and "B" motors rated 7½ hp. and above and at any speed (Order L-221 requires 1800 rpm. speed for 60 cycle, 4-pole motors, 25 hp. and below and corresponding speeds at other frequencies).

In general, the section of Order L-221 dealing with "horsepower loading" lowers the peace-time severe peak-load capacities of motors. Briefly, this restricts the application of motor sizes to values ranging from 80 percent to 91 percent of the calculated or determined horsepower required (See Fig. 6). Before this emergency, a drive requiring 22 brake horsepower would normally have been driven by a 25 hp. motor. Now, a 20 hp. motor is considered adequate. If the motor is then subjected to severe peaks, obviously an "A" cage motor having the larger maximum torque value is more capable of withstanding these peaks. The "B" motor would have a smaller amount of reserve capacity to overcome them.

#### Effect of Low Voltage

With production moving at the war-time pace, most supply lines are heavily loaded. Motors have been added to existing distribution panels and feeders.

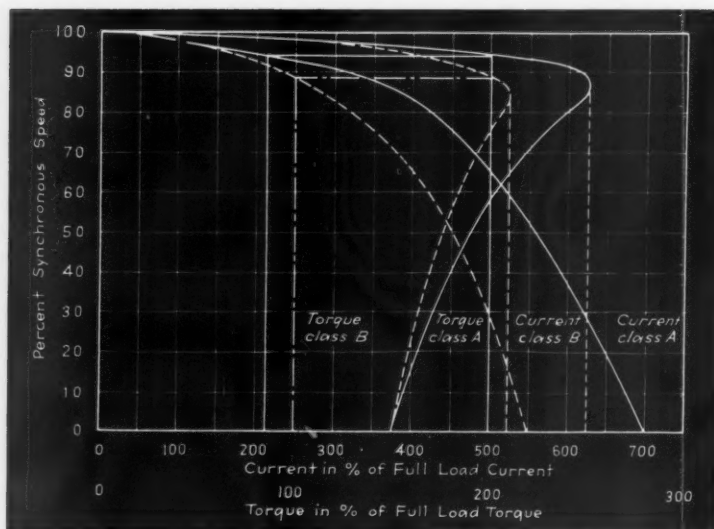


FIG. 2—TORQUE CHARACTERISTICS of the Class "A" and "B" squirrel-cage motors. Speed-current curves are also added to chart.

Electrical Characteristics of the Six Standard NEMA Classes of Squirrel-Cage Induction Motors

NEMA Type Classification	CLASS A		CLASS B		CLASS C		CLASS D		CLASS E		CLASS F	
	NORMAL TORQUE NORMAL STARTING CURRENT	CONTINUOUS	NORMAL TORQUE LOW STARTING CURRENT	CONTINUOUS	HIGH TORQUE NORMAL SLIP LOW STARTING CURRENT	CONTINUOUS	HIGH TORQUE HIGH SLIP	HIGH TORQUE MEDIUM SLIP	LOW TORQUE NORMAL CURRENT	CONTIN.	LOW TORQUE LOW CURRENT	CONTIN.
DUTY												
MAXIMUM STARTING TORQUE	3600 rpm, 2 pole — 100 % 1800 rpm, 4 pole — 150 % 1200 rpm, 6 pole — 135 % 900 rpm, 8 pole — 125 % 720 rpm, 10 pole — 120 % 600 rpm, 12 pole — 115 % 514 rpm, 14 pole — 110 % 450 rpm, 16 pole — 105 %	CONTINUOUS	Slightly lower than Class A	CONTINUOUS	225 % of full load torque	CONTINUOUS	250 % of full load torque	300 % to 400 % of full load torque	Not less than 50 % of full load torque	CONTIN.	Not less than 50 % of full load torque	CONTIN.
MAXIMUM RUNNING TORQUE	Not less than 200 % of full load torque		200 % of full load torque or more but lower than Class A		200 % of full load torque		250 % of full load torque	300 % to 400 % of full load torque	150 % of full load torque		150 % of full load torque	
STARTING CURRENT (Locked Rotor)	600 % to 800 % of full load current (Varies with size, num- ber of poles and voltage)		450 % to 600 % of full load current		Approximately the same as Class B		300 % to 500 % of full load current	400 % to 800 % of full load current	Same as Class A		350 % to 550 % of full load current	
EFFICIENCY	Relatively high even at partial loads. Increases with motor speed and size.		Approximately the same as Class A		Lower than Class A		Relatively Low	Comparable to Class A	Comparable to Class A		Comparable to Class A	
SLIP (% Drop Below Synchronous Speed at Full Load Torque)	1 1/2 % to 5 %		1 1/2 % to 5 %		3 % to 7 %		12 % to 16 %	5 % to 13 %	1 % to 3 1/2 %		1 % to 3 1/2 %	

### STANDARD HORSEPOWER RATINGS

"A" ½, ¾, 1, 1½, 2, 3, 5, 7½, 10, 15, 20, 25, 30, 40, 50, 60, 75

"B" ..... 7½, 10, 15, 20, 25, 30, 40, 50, 60, 75

FIG. 4—HORSEPOWER RATINGS of standard Class "A" and "B" squirrel-cage motors.

CHARACTERISTIC	VOLTAGE (in per cent of rated)	
	110%	90%
Torque		
Starting and Max. Running .....	Increase 21%	Decrease 19%
Speed		
Synchronous .....	No change	No change
Full Load .....	Increase 1%	Decrease 1.5%
Per Cent Slip.....	Decrease 17%	Increase 23%
Efficiency		
Full Load .....	Increase 0.5 to 1	Decrease 2
¾ Load .....	Little change	Little change
½ Load .....	Decrease 1 to 2	Increase 1 to 2
Power-factor		
Full Load .....	Decrease 3%	Increase 1%
¾ Load .....	Decrease 4%	Increase 2 to 3%
½ Load .....	Decrease 5 to 6%	Increase 4 to 5%
Current		
Starting .....	Increase 10 to 12%	Decrease 10 to 12%
Full Load .....	Decrease 7%	Increase 11%
Temperature Rise .....	Decrease 3 to 4° C.	Increase 6 to 7° C.
Maximum Overload Capacity.....	Increase 21%	Decrease 19%
Magnetic Noise .....	Slight increase	Slight decrease

FIG. 5—VOLTAGE CHANGES have definite effect on the operating characteristics of squirrel-cage motors as outlined in this table.

### HORSEPOWER LOADING

The following standards shall be applied in determining horsepower loads for motor ratings:

1. Horsepower required for purposes of ascertaining load as provided herein shall be determined by test or, where test is impossible, by careful calculation or comparison with known power requirements of similar apparatus.
2. Where the motor rated voltage will be maintained and the ambient temperature, normally, will be below 40° C, and will only occasionally, and for short periods, equal or exceed 40° C.

(a) in the case of alternating current motors rated 40° C open type, continuous duty, the horsepower rating shall be not more than 80% of the determined horsepower load.

(b) in the case of alternating current or direct current motors rated 50° C semi-enclosed, or 55° C totally enclosed, continuous duty, the horsepower rating shall be not more than 91% of the determined horsepower load.

(c) in the case of direct current motors rated 40° C open type, continuous duty, the horsepower rating shall be not more than 87% of the determined horsepower load.

Provided, however, — That in any case where the application of any of the above formulae results in a horsepower rating, which is not a standard horsepower rating, the rating may be the standard horsepower rating next above the rating resulting from the application of the formula.

Example — Where the horsepower required as determined in subdivision (1), is 9.3 HP, of which 80% would be 7.44, a motor not exceeding 7.5 standard HP should be delivered.

FIG. 6—HORSEPOWER LOADING is determined, under WPB Order L-221, by applying the standards outlined above.

Additional lighting loads for night shifts also tax available wiring systems. This, at times, may lower the voltage supplied to the motor.

The torques of cage motors vary approximately as the square of the applied voltage. So, if the voltage is 10 percent low, the torques available from this motor are decreased 19 percent. In the case of the "A" motor called upon to deliver a short-time peak of 200 percent full load torque—a 90 percent applied voltage would decrease its breakdown torque from 250 percent to almost 200 percent (See dotted straight lines—Fig. 2). Under the same conditions, the breakdown torque of the "B" motor would drop from 210 percent to 165 percent—causing it to stall.

The self-explanatory chart (Fig. 5) shows the effect of low voltage on the characteristics of squirrel-cage motors. It indicates that the reduction of voltage is likely to be more detrimental to the continued operation of the Class "B" motors as compared to Class "A," since the "A" motor is inherently capable of withstanding peak loads.

### Peak Loads Decide

The relative merits of the Class "A" and "B" motors make both important. On the basis of the considerations discussed above the "A" motor is important, especially for wartime drives. Where the load is steady and maximum torque is never reached, the major advantage of the "A" motor is minimized. However, when peak load requirements are considered of equal importance to the usual considerations of starting or inrush current, it should be an easy matter to decide how to use "A" or "B" cage motors for the majority of industry's drives.

Where continuity of operation and production are subjected to severe peak loads, the use of "A" motors will save production and maintenance man-hours and production machine-hours.

### Other Types

Data on the other types, "C," "D," "E," and "F" are given in the accompanying chart of electrical characteristics of squirrel-cage induction motors. Classes "C" and "D" are specialized types for application requiring high starting torques. Class "C" motors have a rating of 225 percent of full load torque on starting with approximately the same starting current as Class "B" motors. Class "D" motors develop high starting and high maximum running torques with a relatively large slip compared with other types. Typical applications are punch presses, elevators and hoists. Classes "E" and "F" are low torque types used infrequently except in the larger horsepower sizes.



# RIGIDITY

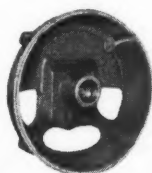


**Keeps Century Motors a-runnin'  
under heavy shocks and  
vibrating loads**

*Five features of Century design combine to assure freedom from distortion — freedom from noise — perfect alignment.*



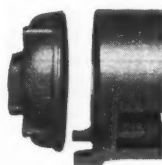
① The feet are cast as part of the motor frame with machined mounting surfaces providing for a firm attachment and alignment, essential when the motor is incorporated as part of precision equipment.



② Rigid curved end-brackets are braced for permanent alignment of bearings to maintain a concentric magnetic field, essential to uniform characteristics and quiet operation.



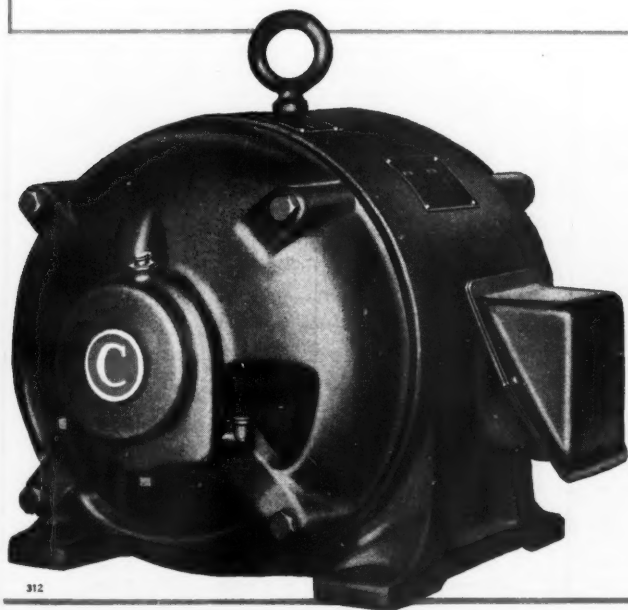
③ Heavily ribbed cast iron frame holds the stator laminations in place — they are locked under pressure — they cannot shift position — the air gap is maintained.



④ A machined bead with close tolerance on the end-bracket fits inside a similarly machined surface on the motor frame — this accurately and permanently aligns the bearings in relation to each other and to the motor frame.



⑤ The rigid steel shaft is larger in diameter through the rotor which prevents deflection — protects against bearing wear.



Thus, when a Century Motor is bolted to a machine or foundation, you can expect uniform and quiet operating characteristics to be maintained for continuous service, 3-shift operation.

Your Century Application and Service Engineer will gladly tell you all of the advantages of Century Motors — help you select the *correct* Century Motor for practically any application, from fractional to 400 horsepower.

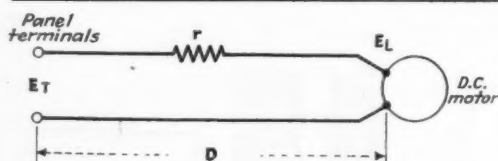
## **CENTURY ELECTRIC CO.**

1806 Pine Street St. Louis, Missouri  
Offices and Stock Points in Principal Cities

**One of the Largest EXCLUSIVE Motor and Generator Manufacturers in the World**

**D.C. Fundamentals****Calculation of wire size, voltage drop and power loss**

In the selection of the proper size and type of wire, three factors must be taken into consideration, namely: (1) voltage drop, (2) power loss, and (3) conductor temperature. The National Electrical Code determines the minimum allowable size for any given set of conditions, providing temperature protection; but excessive voltage drop or power loss may require a larger size.



Where:  $E_T$  = panel terminal volts  
 $E_L$  = load volts  
 $D$  = circuit length one way  
 $r$  = resistance of wire in ohms per 1000 ft.

**Formulas**

$$(1) R = r \times \frac{2 \times D}{1000}; \text{ where } R = \text{circuit resistance}$$

$$(2) \text{ cir mils} = \frac{2D \times I \times 10.8}{e}; \text{ where } I =$$

N.E. Code compliance current for that section of the circuit.

$e$  = allowable voltage drop.

$$(3) \text{ Voltage drop} = IR; \text{ where } I = \text{F.L. current}$$

$R$  = circuit resistance

$$(4) \text{ Power loss} = IR^2; \text{ where } I = \text{F.L. current}$$

$R$  = circuit resistance

A 25 hp., 230 volt, d.c. motor is located 450-ft. from the main distribution panel.  
 Circuit is to be run single conductor in air.  
 Motor F.L. current is 92.0 amperes.  
 N.E.C. compliance current is 115.0 amperes.  
 See section 4312, N.E. Code 1940.  
 Voltage drop is limited to 4 percent.  
 Using formula (2)

$$\text{cir mils} = \frac{2 \times 450 \times 115 \times 10.8}{9.2}$$

$$= \frac{1117800}{9.2} = 121500 \text{ cir mils}$$

Using the next larger standard size, #2/0 is selected.  
 Consulting the N.E. Code #2/0 type R in free air is allowed to carry a maximum of 185 amperes; therefore the Code is satisfied.

Using formula (1)

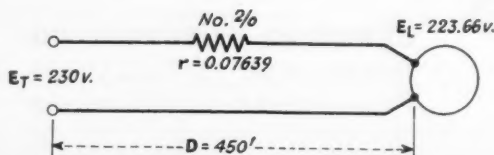
$$R = .07639 \times \frac{2 \times 450}{1000} = .068751 \text{ ohms}$$

Using formula (3)

$$IR = 92 \times .068751 = 6.33 \text{ volts drop}$$

Using formula (4)

$$I^2R = 92^2 \times .068751 = 581.91 \text{ watts loss.}$$



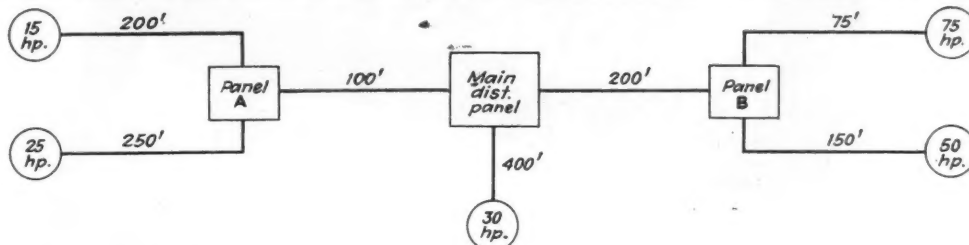
Note: Nos. 14 to 8, solid; Nos. 6 and larger, stranded. No. 18 diam. .040; 1624 cir mils. No. 16, diam. .051; 2538 cir mils.

AWG	Cir mils	Ohms per 1000 ft. 15 C-59 F	Bare Conductor Diameter in.
14	4,107	2.475	0.064
12	6,530	1.557	0.081
10	10,380	0.9792	0.102
8	16,510	0.6158	0.128
6	26,250	0.3872	0.184
5	33,100	0.3071	0.213
4	41,740	0.2436	0.232
3	52,630	0.1931	0.261
2	66,370	0.1532	0.292
1	83,690	0.1215	0.332
0	105,500	0.09633	0.375
00	133,100	0.07639	0.419
000	167,800	0.06058	0.470
0000	211,600	0.04804	0.528
	250,000	0.04147	0.594
	300,000	0.03457	0.641
	350,000	0.02963	0.688
	400,000	0.02592	0.734
	500,000	0.02074	0.828
	600,000	0.01729	0.892
	700,000	0.01481	0.968
	750,000	0.01382	1.000
	800,000	0.01296	1.031
	900,000	0.01153	1.094
	1,000,000	0.01036	1.172
	1,250,000	0.00829	1.290
	1,500,000	0.00692	1.422
	1,750,000	0.00593	1.546
	2,000,000	0.00518	1.630

## Wiring

### Calculating D.C. Conductor Size

A hypothetical case is used for determining wire sizes in wiring an industrial plant for five large motors. At the main distribution panel, 230 volts is available. No overall voltage drop is to exceed 5 percent. Feeders will be allowed 2 percent drop and branch circuits 3 percent. All wiring to be single conductor in free air.



Type R wire will be used throughout except for the 400-ft. run to the 30 hp. motor and 200-ft. run to panel B which are both outdoor, and type W will be used.

Calculations will be made as per Data Sheet F-3.

Circuit	Dist. Feet	Max. Volts Drop	Full Load Current	Code* Compliance Current	Calculated	Wire Size Next Larger Standard	Code Min.	Actual F.L. Volts Drop
Main Panel to 30 hp. ....	400	11.5	110	137.5	103300	1/0	1	8.5
Panel A to 15 hp. ....	200	6.9	56	70	43830	3	5	4.3
Panel A to 25 hp. ....	250	6.9	92	115	90000	1/0	2	4.4
Main Panel to Panel A. . .	100	4.6	148	171	80300	1	2/0	2.3
Panel B to 75 hp. ....	75	6.9	268	335	78650	1	350000	1.2
Panel B to 50 hp. ....	150	6.9	180	225	105650	1/0	4/0	2.6
Main Panel to Panel B. . .	200	4.6	448	515	483600	500000	500000	3.7

### Sample Calculation

#### Panel A to 25 hp. circuit

$$\begin{aligned} \text{cir mil} &= \frac{2D \times I \times 10.8}{e} \\ &= \frac{2 \times 250 \times 115 \times 10.8}{6.9} \\ &= 90000 \text{ cir mils} \end{aligned}$$

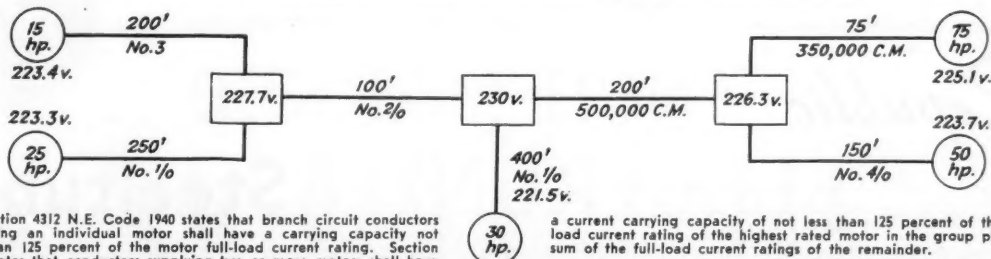
No. 1/0 wire would be selected so as to keep the voltage drop below 3 percent even though the Code only requires No. 2 so far as current carrying capacity is concerned.

#### Panel B to 75 hp. circuit

$$\begin{aligned} \text{cir mil} &= \frac{2D \times I \times 10.8}{e} \\ &= \frac{2 \times 75 \times 335 \times 10.8}{6.9} \\ &= 78650 \text{ cir mils} \end{aligned}$$

No. 1 wire would be sufficient to keep the voltage drop down to 3 percent but its current carrying capacity is far too insufficient and cables would heat up. Therefore, the Code provides protection by requiring use of 350000 cir mils in this case.

In other words, if calculations are made as in the above table form, the larger of the two (i.e. calculated and Code required) should be selected for installation.

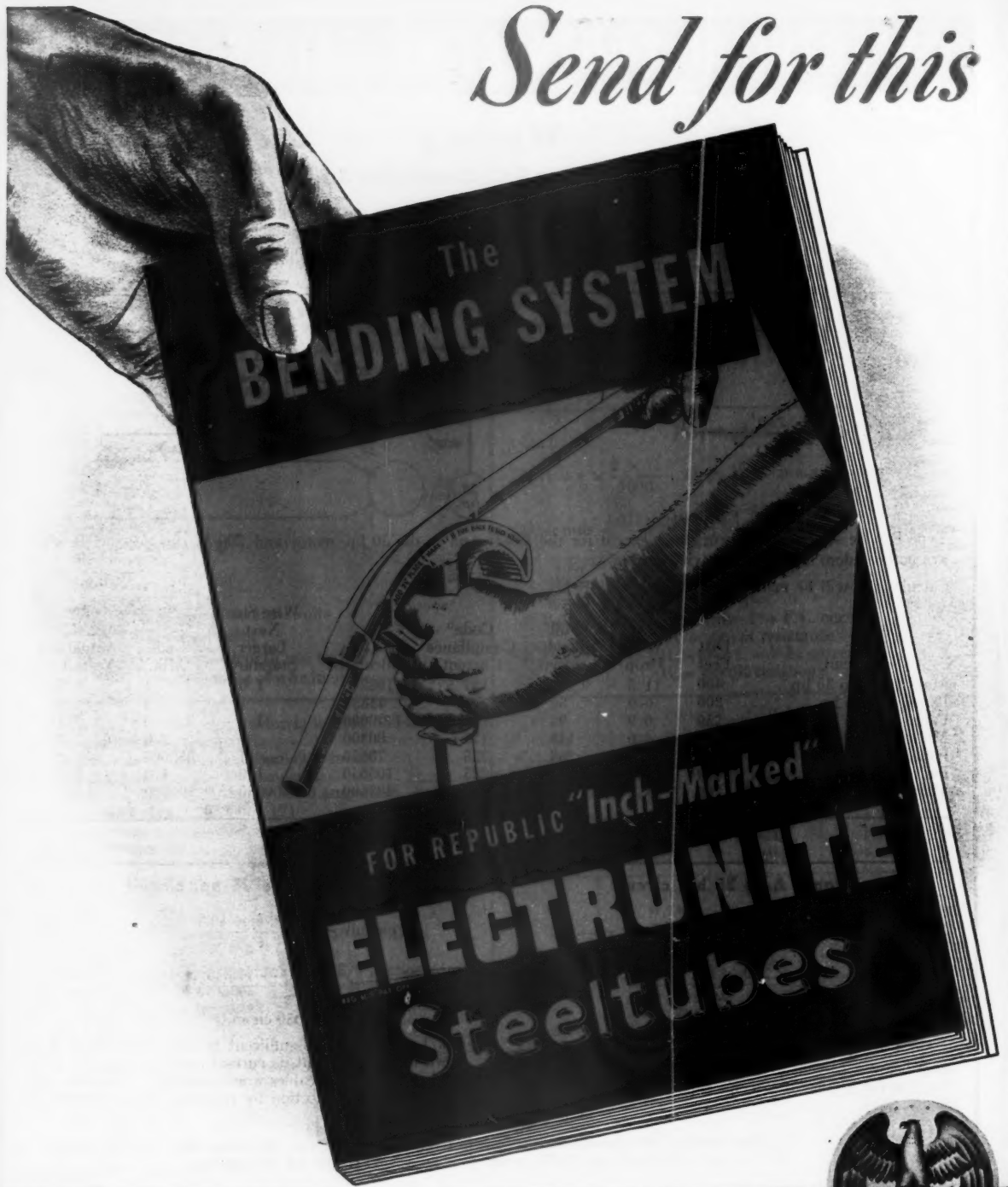


\* Section 4312 N.E. Code 1940 states that branch circuit conductors supplying an individual motor shall have a carrying capacity not less than 125 percent of the motor full-load current rating. Section 4314 states that conductors supplying two or more motors shall have

a current carrying capacity of not less than 125 percent of the full-load current rating of the highest rated motor in the group plus the sum of the full-load current ratings of the remainder.



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# Reader's QUIZ

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## CONDUIT BENDS

**QUESTION 102.** *It is advisable to use a solid wire form when making a number of identical conduit sections involving several bends?*  
—F.R.B.

**A.** TO QUESTION 102. When fitting bends of large conduit in a limited space it sometimes becomes necessary to make a template of the bend from some material such as small conduit or wood, solid wire is not satisfactory due to lack of rigidity.

A very good method is to lay out the angle and dimensions of the kind on a flat surface such as a concrete floor with chalk and work the bend to that.—B.C.M.

**A.** TO QUESTION 102. A solid rod or wire that will hold its shape can be used as a template for making bends in conduit. If it is a large conduit that is being bent a piece of  $\frac{1}{2}$ -in. conduit will serve the purpose quite well.

It should be noted that the National Electrical Code does not permit the installation of more than the equivalent of four quarter bends between outlets.—L.H.

**A.** TO QUESTION 102. It hardly seems advisable to use a solid wire as a form to make duplicate bends in conduit. If several duplicate bends are required, the first could be used as a pattern. Ordinarily, the length and angle are determined and the proper form is marked on the floor using a wall as a stop. The end of the conduit can be placed against the wall and the bend made at the point marked on the floor.—J.E.W.

## SQUIRREL-CAGE INDUCTION MOTORS

**QUESTION 103.** *We have a machine that requires a two hp. motor to take care of the load. Would it be practical to use two 1-hp. squirrel-cage induction motors with the same characteristics? The two 1-hp. motors are to drive the machine from the same shaft.*—R.E.P.

**A.** TO QUESTION 103. It is assumed that this refers to the use of two general purpose squirrel-cage motors in which case it is possible to operate the two motors to drive the single machine. This is called operating the motors in parallel.

It should be pointed out, however, that, in order to operate satisfactorily, the two motors should have similar operating characteristics in order that each motor will carry its share of the load. If the speed of one motor under rated load is materially different from the other, it is obvious that the motor which operates at the higher speed will take more than its share of the total load when both motors are coupled to the same machine. This is called "hogging" the load and, where the total machine load is equal to twice the rating of one motor, it is evident that this hogging results in overloading the one motor and permitting the other motor to operate underloaded.

To determine in advance whether one of the motors will hog the load when operated in parallel with a second motor driving a common load, each of the motors should be operated at rated nameplate amperes, and, if the speeds are practically identical, the two motors should operate successfully in parallel, each carrying its proportionate share of the total load.—W.C.R.

**A.** TO QUESTION 103. It would be possible to use two 1-hp. squirrel-cage induction motors with the same characteristics to drive a machine from the same shaft. It would probably be desirable to have some resistance in the leads to the motor so that there would be no doubt about their ability of dividing the load properly.

The real solution to the problem might be gone into a little further in order to find out whether or not the two hp. is really needed. We have found instances where the type of results which R.E.P. wishes to secure can be handled by boosting slightly the voltage on a smaller motor as the available pull out torque of a motor goes up as the square of the voltage.

It might be possible to do something of this sort and save the other motor for war time needs. On a job here a  $\frac{3}{4}$ -hp. motor is doing the work of a  $1\frac{1}{2}$  hp. but is running at over-voltage.—M.A.H.

**A.** TO QUESTION 103. Using two 1-hp. motors would be practical if direct connected or if the belt tensions were closely watched to maintain an even pull on each motor. A single two-hp. motor is far more advisable and this is my recommendation.—C.E.S.

**A.** TO QUESTION 103. It will be practical only on condition that each motor will get close individual overload protection for the following reasons: (1) If one belt should get loose slightly, it will throw part of its load on the motor with the tighter belt. (2) Should one motor change its speed characteristics for some reason, such as a loose rotor bar, etc., then the motor with the higher speed will have to carry more than its share. (3) Should a fuse on one motor blow, the second motor will pull double its load.—H.S.

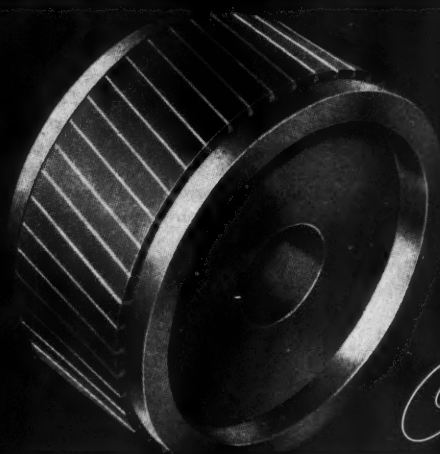
**A.** TO QUESTION 103. If the two 1-hp. motors are made by the same electrical manufacturer they will undoubtedly work successfully when coupled to the same load. However, even supposedly duplicate induction motors may have a slightly different speed at full load even though they have an identical synchronous speed. Referring to the diagram, point A represents the speed of a 1,200 r.p.m. (synchronous) induction motor carrying 100 percent (1 hp.) load. If two motors are used and one has a speed of slightly more than this and the other has a slightly lower speed at 100 percent load, then they will not divide the load exactly 50-50. Since they are coupled to the same load, they must run at the same speed, and the slower speed motor



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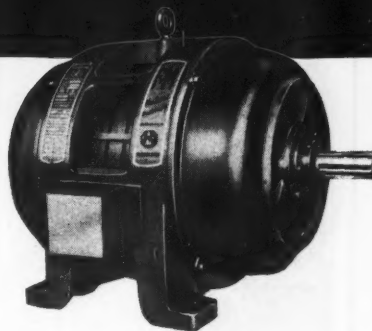
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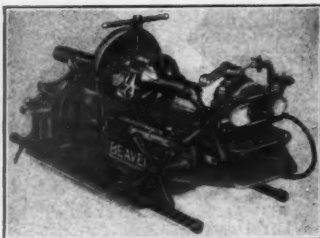
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# Motors

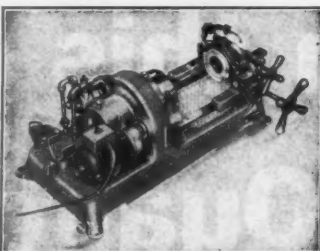
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Write for Bulletin A



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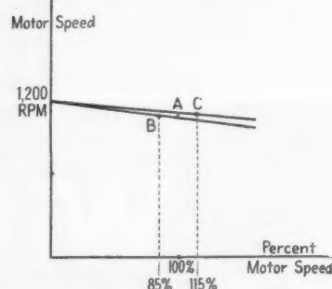
## BEAVER PIPE TOOLS

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## Reader's QUIZ

[FROM PAGE 64]

will be carrying 85 percent of its normal rating (point A on the diagram) and the higher speed motor will be taking 115 percent of its rating (point C). This will show up in the heating of the motors as the higher speed motor will naturally run hotter. However, all open type continuously rated 40° C.



general purpose induction motors have a "service factor" when operated at rated voltage and frequency which permits them to carry 1.15 times their rated load with, of course, slight differences in efficiency and power factor from those at rated load. Connect up the motors and watch the heating for the first few hours while carrying maximum load and, if no overheating is detected after eight hours, it can be assumed that the drive will operate successfully.—R.F.E.

**A.** TO QUESTION 103. If either motor is not overloaded, the two motors may be used to drive the machine satisfactorily from the same shaft. Even though the two motors are assumed to have identical characteristics and driving arrangements, the load carried by each motor will be different.

It is almost impossible to find two motors of normal manufacture to have identically the same characteristics. Even if this were possible, the share of load carried by each motor would be affected by the following factors: difference of terminal voltage on the motors due to line drop; difference in the tension and slip of belts; discrepancies in pulley diameters and sizes; possible difference of rotor resistance caused by defective connections between squirrel-cage bars and short-circuiting rings, causing the motor with the poorer rotor connections to take a smaller share of the total load; and unequal wear of bearings and consequent eccentricity of rotors changing the electrical and mechanical characteristics of each motor to a different extent.—R.G.C.

**A.** TO QUESTION 103. If the two motors are connected directly to the load they should be able to take care of the two horsepower load after it is started. If the load can be made light at starting it should be satisfactory, otherwise some trouble may develop. If there is trouble in starting perhaps a clutch arrangement can be provided to permit starting the motors under light load conditions.—J.E.W.

## POWER FACTOR UNITY

**Q**UESTION 104. In my place we operate at day time load with a power factor running anywhere from unity to 75 or 80 percent. We have a motor generator set delivering d.c. to the plant motors and this unit is in turn driven by a synchronous motor. This same motor gets its d.c. for excitation from the busbars fed by its generator and starts as an induction motor. Also we have a synchronous motor operating a refrigerating unit.

However at night and late in the evenings when the load falls off the power factor swings over to leading, sometimes as much as it was lagging in the day time loads. Should this leading power factor be corrected? And how does it affect the power bill?—R.G.S.

**A.** TO QUESTION 104. The leading power factor under light load conditions should only be controlled to the extent of minimum synchronous motor field excitation. Introduction of any form of reactive lagging load to compensate for a leading power factor, will only increase distribution circuit load losses.

Since most power rate schedules have two factors in arriving at net power costs, a demand charge and an energy charge, obviously under light and leading power factor, the demand at this time will be less than previously established demands under full load conditions. Therefore, the only penalty in power costs under conditions as stated will be distribution circuit heat losses in kilowatt hours only, as a result of increased line amperes with leading reactive currents.—T.F.S.

**A.** TO QUESTION 104. You ask if the leading power factor which becomes almost as much leading as the power factor is lagging during the day should be corrected and how does it affect the power bill. In order to properly answer your question it would be

necessary to know how you are charged for your use of electrical energy. I assume, since you do not state, that the electric company supplying your company with energy does not have any check on your power factor, or if any at all merely the method, sometimes used, of increasing the rate in accordance with the lowered power factor. If such is the case the leading night power factor has no effect on the power bill and need not be corrected. If there is an arrangement for checking the power factor and making it a factor of the power bill the leading night power factor should result in raising your 24 hour average power factor and thus lowering your power bill.—W.B.M.

**A.** TO QUESTION 104. Unless a large block of power is involved, the leading power factor under light load conditions is normally neglected. It is therefore doubtful that there is a surcharge clause for the leading reactive power in your power contract.

The saving in real power by correcting for the leading reactive power will be the reduction in I<sup>2</sup>R losses resulting from the reduced current. Since the circuit resistance is small and under light load conditions the current is also small, the power saving would be practically negligible. Correction beyond reducing the motor excitation to the limit of the assumed standard rheostat would not seem to be justified, should even this precaution be deemed advisable.—G.I.S.

**A.** TO QUESTION 104. Assuming that all the load as described is synchronous equipment, the ideal condition would of course be operation at unity power factor, which can readily be accomplished by proper adjustment of the excitation of the fields of the motors of each machine.

If, however, in addition to the loads mentioned, there is an inductive load on the plant system which cannot be brought to unity power factor by over excitation of the synchronous motors because of insufficient kva. capacity, but is compensated to the available limits of operation of the two synchronous machines, and the setting of the synchronous motor fields results in leading power factor as the inductive loads fall off, or as more correction becomes available as a result of the load on the synchronous motor of the M.G. set being reduced, whether the excitation of the synchronous machines should be reduced or not, to bring the power factor back to unity, depends entirely upon how the power company meters and charges for power. If a reactive kva. hour meter of the reversible type is employed, the leading power factor is desirable as the lagging kva. hours can be offset; otherwise, the machines should



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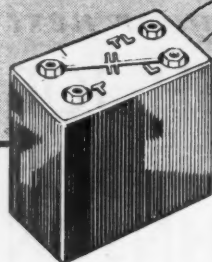


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## Reader's QUIZ

[FROM PAGE 67]

be adjusted to operate at unity power factor which results in minimum losses and maximum efficiency.

If the lagging power factor during peak loading is occasioned by a drop in voltage in the d.c. generator output with all resistance out of the field circuit of the synchronous motor, then a separate excitation generator should be installed in order to properly excite the synchronous motor to unity power factor for best efficiency. If reserve capacity is still available and the power rate of metering set up provides a bonus for leading power factor, operation of the motor with over-excitation would thus be possible and desirable.—A.K.G.

### D. C. GENERATOR

**QUESTION 105.** In the past at our saw mill, we have operated a 120 volt d.c. generator 5 kva. for lights and a few small motors in filing room. Now this generator is in bad shape and I have a chance to buy practically a new d.c. machine where another mill has cut out, but this machine is 240 volts, 8 kva. I would like to have the 240 for one motor on the job, but would like to know how to cut this 240 to 120 for the rest of our operation.

As we will not have over 1500 feet of line one way from generator, could we use a transformer? R.M.H.

**ANSWER TO QUESTION 105.** If the proposed 8 kw., 240 volt generator is not a 3-wire machine, one solution to the problem would be to install a balancer set. This consists of two exactly similar 110 volt d.c. generators, connected in series and solidly coupled to each other. This equipment floats across the 220 volt line and supplies a neutral for 110 volts. It can be placed anywhere that is convenient.

To reduce the size of the balancer, it would be well to convert the existing lighting and small motor feeders to a 3-wire system. Then, if the maximum unbalance does not exceed 15 percent (or 750 watts) two  $\frac{1}{2}$  kw. generators or two  $\frac{3}{4}$  hp. motors would be quite sufficient. Each half of the balancer should be able to supply its own losses plus one-half of the unbalanced wattage.

The diagrams show the better arrangements of shunt and compound wound machines.

### NON-STOP PRODUCTION with



#### TRICO OILERS

No need to stop production to oil machines—no bearing failures due to lack of oil—no waste. Modernize your equipment and conserve critical materials, man-power, and increase production. INSTALL TRICO AUTOMATIC OILERS!



#### KLIPOKS

That jack-screw pressure literally bolts fuses and clips together!

**KLIPOKS ELIMINATE:**

- Unnecessary shut-downs.
- Premature fuse blowings.
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- Burnt fuses and clips.
- Wasted current.

Use KLIPOKS everywhere. They create immediate results and pay for themselves quickly.



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TRICO FUSE MFG. CO., Milwaukee, Wis.  
In Canada: IRVING SMITH LIMITED, Montreal

### FRONT LINE Speeder Uppers

for

#### Busy War Plants



Fig. 700—1 Hole



Fig. 701—2 Hole

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For supporting thin and thick wall pipe, conduit and armored cables.

Use with PAINE #900 Machine Screw Lead Anchors, #950 Lead Wood Screw Anchors, and #955 Fiber Wood Screw Anchors for fastening to solid walls and ceilings.

Ask your Supplier NOW and Write for Catalog.

THE PAINE CO.

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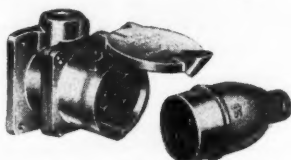
★ **PAINE** ★  
FASTENING DEVICES  
and HANGING

# PLUGS and RECEPTACLES

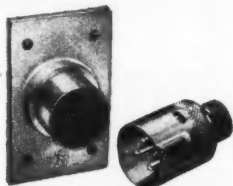
Dependable service is built into Pyle-National plugs and receptacles—with full bakelite insulation, protected contacts, and heavy steel or cast metal housings. They are proving their extra value on thousands of tough jobs. The complete line allows you to choose the correct type for use with any portable electrical equipment, signal and control circuits, pyrometers, extension lights, high frequency tools, welders, battery chargers, and similar equipment.



**General Purpose** plugs and receptacles: 1, 2, 3, 4, 5 poles, ratings 30, 60, 100, 200 amperes. Round prong contacts, rugged cast metal housings to withstand severe service.



**QuelArc** circuit breaking types; 2, 3, 4 wire types, ratings up to 200 amperes. Exceptional protection to contacts, for safe use as current rupturing devices.



**Triploc and Multiple Circuit** plugs and receptacles; 1, 2, 3, 4, 6, and 8 pole contact units, allowing assembly in combinations up to 32 poles. Manual and automatic release features. Ideal for portable tools, pyrometers, signal and control circuits.

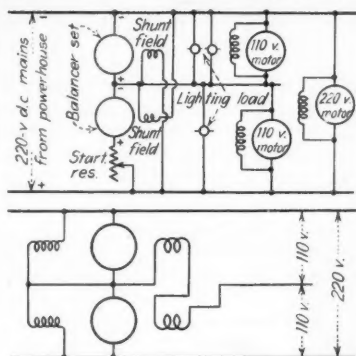


**Midget Triploc**, compact, but with many exclusive heavy duty features for dependable service under severe conditions; 2, 3, 4 pole types.

Write for your copy of Pyle Catalog 1100 with complete listings of all types.

**The Pyle-National Company**  
1344 N. Kostner Ave. • Chicago, Ill.

The system suggested would be the most flexible if equipment and material is available. 220 volt lights are obtainable, but each of the small motors would



have to be supplied with an individual resistance ballast. And resistances in series with motors would cause wide speed fluctuations with varying loads.—L.E.B.

**A.** TO QUESTION 105. It would not be feasible to use the 240 volt, 8 kw. generator to supply a 240 volt motor and other motors and lamps at 120 volts. A 3 wire, 120/240 volt generator would fill the bill, but might be hard to obtain.

Unfortunately, with direct current it will not be possible to use a transformer, so that plan is out.

If you can get 240 volt motors, you might operate all at 240 volts, as 240 volt lamps are available. In such case you should use 2 pole lighting switches, cartridge fuses and provide proper grounding and protection.

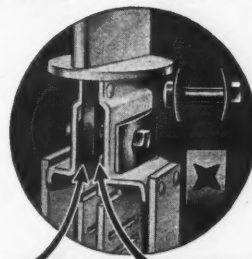
In an emergency you could reduce the voltage on the generator to near 120 volts by reducing speed and by reducing field strength by increasing resistance in the shunt field circuit. If this is done the available power will be cut (probably to 4 kw.) and the generator will not be stable in operation.—J.E.W.

**A.** TO QUESTION 105. Since the generators in question are d.c., a transformer cannot be used to reduce the voltage. If all motors could be replaced or rewound for 240 volts the simplest solution would be to operate the motors on this voltage and use two lights in series or use 240 volt lamps for the lighting. However, by using some additional equipment a 3-wire 240/120 volt system could be installed which would give a more satisfactory solution and permit the use of 120 volt motors.

One method requires some modification of the generator. Two slip rings must be installed. This will probably require a shaft extension with a hole drilled in the shaft to permit leads to run through the bearing from the commutator to the slip rings. With the arma-



## WARE HI-LAG



## NON-HEATING CONTACTS

### Keep Motors Humming

- End Over-Heating
- Stop needless fuse blowing
- Time-Lag 2 to 5 Times Normal Current
- Certified to Comply—Federal Specification W F 803a-Type II

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Renewable  
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## "SHERARDUCT" IS THE SHERARDIZED CONDUIT



*Rustproofed*

**INSIDE  
AND  
OUT**

*Even at the base  
of the threads*



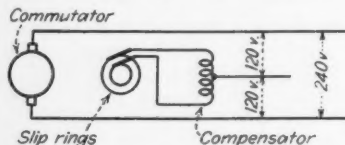
**National Electric  
PRODUCTS CORPORATION**  
Pittsburgh, Pa.

## Reader's QUIZ

[FROM PAGE 49]

ture setting in any position connect a lead from the commutator segment under each positive brush to one slip ring and from the segment under each negative brush to the other slip ring. These leads may be soldered to the ends of the commutator segments.

Of course, brushes must be provided to ride on the slip rings. A compen-



sator must be used, the size of which will depend on the probable amount of unbalance. If the lighting can be kept very nearly balanced at all times the compensator need be only large enough to handle the motor load. The generator and compensator are connected as shown in the figure. Field circuits will not be changed and are therefore omitted.—M.E.E.

### Can You ANSWER these QUESTIONS?

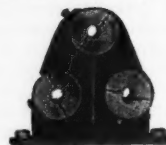
**QUESTION E4**—We have a 460 volt, 3 phase, No. 4 cable buried directly in earth 450 feet in length, which is open but is neither grounded nor short circuited. What is the simplest way to find the break in this cable—R.E.G.

**QUESTION F4**—With a 1500 kva. alternator, three phase wye connected at 13,500 volts, and 90 percent power factor, with 2 ohms per phase resistance and a synchronous reactance of 40 ohms, how can I compute the regulation on full load?—G.S.E.

**QUESTION G4**—We have in a factory boiler house, a row of 300 watt lamps in steel reflectors, mounted about twenty feet from the floor on a wall facing the boilers. These reflectors are mounted on type T condulets with a 12 inch long pipe nipple bent to about 45 degrees, so that the light will shine down toward the center of the boilers. The lamps in these reflectors keep burning out. The voltage has been tested, the circuit examined and everything is in good condition, the lamps are the same as those used in the other parts of the factory. Could someone tell us why these lamps have such a short life?—R.M.

**PLEASE SEND IN  
YOUR ANSWER BY SEPTEMBER 1**

## SIMPLICITY PLUS! New NON-INDUCTIVE CABLE RACK for INDUSTRIAL PLANT WIRING



Type D-F 3-Conductor Cable Rack, New Non-Inductive Design. Racks available for Cable sizes from 5/16" to 2 1/2".

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Send today for Bulletin C-5-51 which illustrates the complete line.

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### Match the WIRE to the Job

*Specify*  
**ESSEX**  
**MAGNET  
WIRE**



### Be Sure of These Points

- Quality of Insulation
- Ease in Handling
- Economy
- Highest Conductivity
- Adaptability for Winding
- Resistance to Abrasion
- Resistance to Chemicals
- Resistance to Impact

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**INSULATION & WIRES, Inc.**  
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181 Portland Street, Cambridge, Massachusetts



is the power distribution system which combines the functions of both circuit protection and control. Power is supplied to the distribution system through a bank of three 100 kva. transformers, which reduce the voltage from 4000 to 440 volts for distribution to the individual motors. Use of 440 volts for internal distribution, instead of 220 volts, reduces by half the amount of copper needed for secondary conductors, and materially reduces the size of control and circuit protective equipment. The main secondary feeder to the plant terminates in a Westinghouse De-ion circuit breaker panelboard. Breakers in this panel protect branch feeders. These feeders in turn supply power to seven combination circuit breaker panels and control centers.

The combination control centers comprise a most interesting application of up-to-date electrical facilities. Each control center is so located that it will serve a group of motors. An individual circuit is run from the panel to each motor, and a circuit breaker is provided for the protection of each circuit. A magnetic starter is provided for control of each motor. Both the circuit breaker and the starter for each circuit are mounted in the control center, thus leaving only the motor and the pushbutton station to be mounted at the site of the machine. Removing this equipment from areas where it would be subject to dirt as well as excessive moisture on the "wet" side, eliminated the need for dust-tight and water-tight enclosures.

Panels are dead front, the face of each panel being set out three inches from the surface of the wall to allow the entrance of conduits run against the wall. From the main distribution panelboard the branch feeders are run in Transite ducts underground to a large junction box in the center wall, from which these feeders are carried in Transite ducts to the combination control centers. From the control centers the motor and control circuits are run in steel conduit of  $\frac{3}{4}$  inch size or less to the driven machine.

Leather products processed at this tannery are of various grades or hide, including chrome full grained, split chrome, full grained elk, snuff elk, mechanical leather, coat leather, yellow latigo, white latigo, and shoe string. A principal product is chrome full grained mechanical leather from which are made oil seals and other industrial packing devices, indispensable to apparatus vital to military and industrial use.

## This simple substitution is a tremendous contribution

# to Victory



SAME SIZE...

SAME APPEARANCE

But one saves  
CRITICAL COPPER

**A**UTOMATIC motor control certainly simplifies the operation of motorized machines and adds tremendously to machine operators' convenience. But it is also true that such automatic control equipment requires much more copper and time for manufacture than similar manual motor control to do the same job. This is an important consideration today and it means that manual motor control should be selected wherever and whenever possible...until Victory. To do otherwise is to insist upon convenience at the

expense of the nation's critical material supplies and vital manufacturing capacity. Adopt this sensible and patriotic war-time policy for your motor control purchases. Recommend it to other users of electric motors. Any field engineer of any control manufacturer will be glad to help you put this policy into effect. Call him in today...CUTLER-HAMMER, Inc.,

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## CUTLER-HAMMER

### MOTOR CONTROL

## C-H

# To help maintenance men get more service from fuses—



Send for  
"FUSEOLOGY"  
—A FREE HANDBOOK  
by the MAKERS  
OF BUSS FUSES

## When a Fuse Blows

By the word "fuse" we mean either an air fuse or a safety fuse. In either case, a fuse is a device which is designed to melt and break a circuit when an overload has occurred or some kind of trouble exists.

When a fuse blows, an overload has occurred or some kind of trouble exists.

This is on the assumption of course that the fuse was of a reliable make and was of the correct size.

**Hint for the trouble**—Correct the trouble or reduce the overload. Don't put in a new fuse until you find the trouble. If the fuse was right, it would not blow if there had been nothing wrong. Regardless of how difficult the trouble is to find, do not make the mistake of installing a new fuse and then blaming it if it seems to open prematurely.

Don't blame the fuse. You had it there for the purpose of protecting you and your equipment and if it has blown, it has done exactly what you would wish it to do under the circumstances.

The fuse did not deteriorate. Hint for the trouble—Reliable fuses do not deteriorate so long as they are kept in good 100 years from now, as they are today, it is not over loaded or subjected to poor contact.

## Where to Look for the Trouble

Sometimes it may be a little difficult to locate the trouble that caused the blowing of the fuse. For almost any motor trouble, the following suggestions may prove helpful.

### Motor Starting Trouble

If the fuse is protecting a motor, and blows on starting, it may have been one of the following to check that a good

will be, or dry or tight bearings.

Connect or not clean brushes on direct current motors not in neutral position. Brushes on direct current motors not in neutral position. Motor being brought up to full speed too quickly. Motor may already be started for starting a worn bearing leaving the armature close to or touching the stator.

In such cases the blowing of the fuse warns of trouble long before it would otherwise have been noticed and in time to prevent more serious damage. The conclusion should



# BUSS

**W**ITH this helpful guide and handbook, even a new man can learn easily and quickly to service fuses properly.

Written in clear, simple style and well illustrated, it is a "training manual" for practical men.

It's *usable*, for it contains the very information that every maintenance man should have at his finger tips —

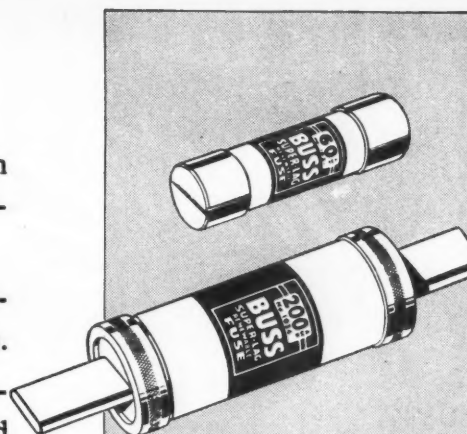
- ✓ What to do when fuses blow
- ✓ Where to look for trouble that caused fuses to blow
- ✓ What to do after you have found the trouble
- ✓ How to select the right type fuses for various circuits
- ✓ How to determine proper size fuse or fusetron to use for different applications
- ✓ How to save material and cut costs on motor installations
- ✓ And many other helpful suggestions that will help anyone reduce lost time by reducing shut-downs due to improper fusing.

*Why not get this complete handbook free?*

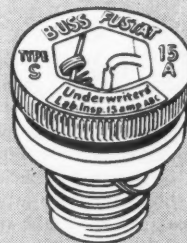
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PLEASE PRINT  
 Company \_\_\_\_\_  
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 City & State \_\_\_\_\_



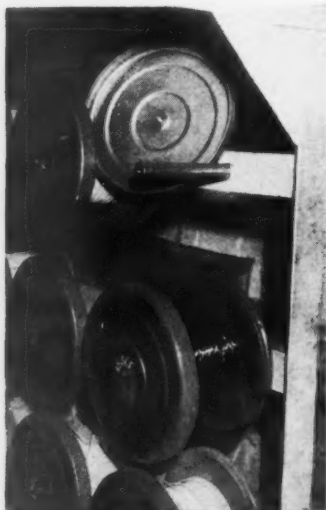
# Motor Shops

## ANTI-SNAG REEL DISCS

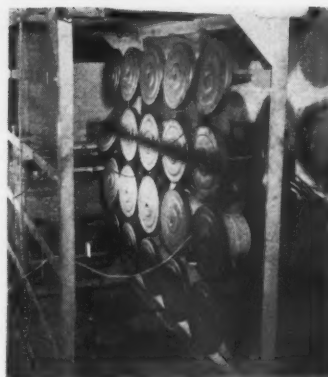
Mechanics in the motor service shop of the Sullivan Electric Co., Cincinnati, Ohio, need not worry about magnet wire kinking and snagging when they unwind it from the 20-reel pay-out rack in the winding department. Ball bearing mounted, flanged metal discs covering one end of the reels do the trick.

The pie-plate shaped disc have flanges of sufficient depth to cover the rim of the reel. When the wire is pulled out at right angles to the axis of the reel, it is guided by the disc which rotates freely and follows the wire around the rim of the reel. Snags, kinks and damaging abrasion are thus eliminated.

The wire reel itself is supported by a solid steel pin mounted to the steel channel support on the rack. After the reel is slipped over this bar the disc is fastened by means of a hexagon head bolt which fits into a threaded hole in the pin. Sufficient leeway is given so the discs will rotate freely on its ball bearing mounting.



**CLOSE-UP** of flanged metal disc covering magnet wire reel, showing the mounting arrangement. Flange edge is rounded off to prevent damage to wire.



**BALL BEARING DISCS** rotate freely around these magnet wire reels preventing snags and kinks when the wire is paid-out through the guide holes at the front of the rack.

After leaving the reel, the wire is threaded through small guide holes on the opposite side of the rack. These holes act as a partial tension device and help straighten the wire. The rack accommodates four tiers of reels, with five in each row.

## STATOR STRIPPING

The motor repair man must exercise due care and skill in stator stripping to obviate possibilities of damage to the laminations. The stator is built up of laminations which are insulated from each other for the purpose of reducing eddy current loss in the stator iron. If in removing the coils, the laminations become distorted, scored or damaged the iron may become short circuited, increasing eddy current losses. Further, damage may be done in loosening rivets which hold the laminations together and vibration, humming and increased noise might result. The teeth are the most fragile and bending them in and out, back and forth may either break them off or cause a vibrating noise when the motor is put back in service.

It is common practice to use certain



**STATOR** being heated by acetylene torch prior to stripping.

methods of stripping which give great leverage such as a drill press or a system of pulleys, motor or hand operated. Schulz and Ingram Inc., motor repair shop in New Haven, Conn., however, have abandoned the greater leverage practices. Sometimes the operators when pulling coils do not know their own strength. If the coil won't come they keep adding more pressure until it finally gives. Often damage results. So Ingram in search of a less powerful method of extracting coils, came across a utility clipper which he claims will do the job quicker, easier and with practically no chance for damage to the laminations. The gripping jaws of the clipper are offset on an oblique angle to give the operator leverage in getting the coil started. Once started the coil will generally come easy with a steady pull. If it happens to come hard, the coil can be jacked out all the way.



**UTILITY CLIPPERS** are used to jack the coil out of slot. Once started it will generally come with a steady pull.

# DEPENDABLE CONTROL



**OF POWER**  
aimed to destroy  
enemy forces



**OF POWER**  
aimed to sustain  
our forces

**ARROW serves  
with dependable SWITCHES**

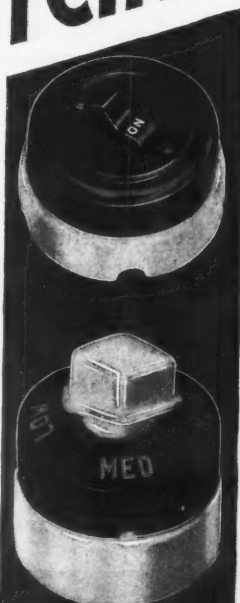
Their service to the firing-line stems from flawless service at the production-line. "Hot wires", heavy loads, round-the-clock operating schedules, — these demand super-stamina in switches.

So install or replace with ARROW Switches for continuous, positive ACTION on production-lines. . . Heavy-duty controls for lighting and power circuits; specification-grade T-rated 10, 20 and 30 Amp. "Type C" Switches, Rotary Snap Switches, Ceiling Pull Switches, Door Switches, Flush Tumbler Switches with or without outlet box covers. You'll find in them the fighting Quality to keep functioning.

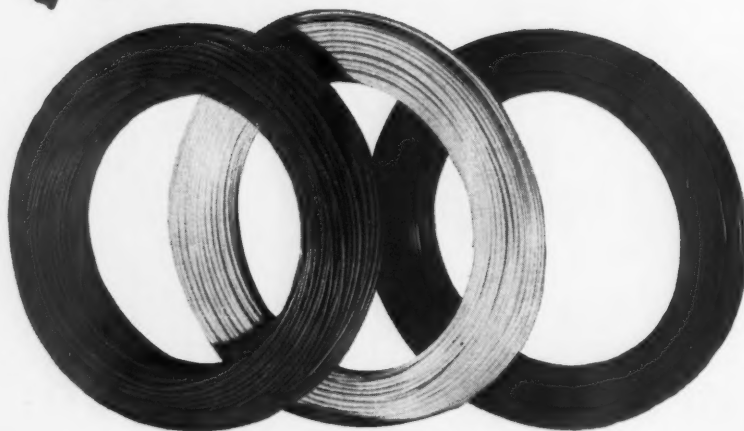
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ELECTRICAL WHOLESALERS**

**ARROW ELECTRIC DIVISION**

**THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN., U.S.A.**



# FOR ALL War Wiring



## FLAMENOL\* BUILDING WIRE

TYPE SN

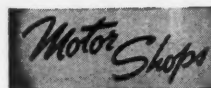
Use this small-diameter thermo-plastic building wire for all war-purpose wiring jobs. It is available in sizes 14 and larger. Flamenol Building Wire is ideal for maintenance wiring . . . for re-wiring . . . for new wiring. Its small diameter, comparative light weight and smooth finish make it easy to handle. Its insulation is superaging, high in dielectric and mechanical strength, flame retarding and resistant to oils, moisture, acids, etc.

You can obtain this dependable wire now because the available supply of resins has improved. They are permitted for electrical conductor insulation wherever copper is allocated.

For further information on Flamenol Building Wire, see the nearest G-E Merchandise Distributor or write to Section W831-8, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

\*Reg. U.S. Pat. Off.

**GENERAL  ELECTRIC**

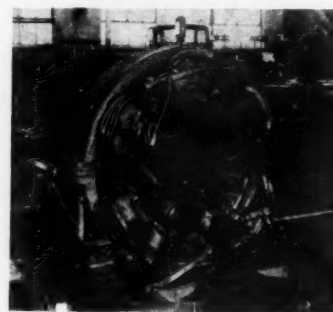


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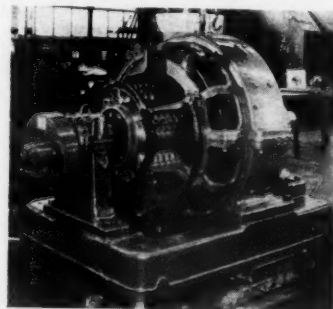
The stator frame is heated first with an acetylene torch to release the hard varnish grip of the coils on the laminations. Heat must be applied carefully to avoid frame distortion and the possibility of altering iron characteristics. Ingram's men who have stripped stators by various methods favor the use of the clippers.

### REBUILT FROM JUNK

The Westinghouse motor repair shop in Cincinnati recently received the pictured steel mill edger drive motor. It was a 250-hp., 230-volt, variable speed, 400-800 rpm., d.c. motor. Russ Bogardus, shop foreman, asked jokingly, "What shall we do with it—repair it?" For in normal times it most certainly would be scrapped. However upon investigating the possibilities of obtaining a new motor, it was found that delivery would be at least 10 or 11 months. The bed plate was broken and cracked in



**THIS MOTOR** was not junked. An open field circuit caused a runaway which snapped the bearing pedestals wrecking both stator and armature. Armature can be seen in background.



**TWENTY-ONE DAYS** found the motor ready for service. The armature was dynamically balanced in addition to a complete rebuilding of armature and stator.



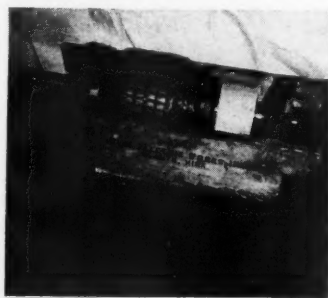
many places and both bearing pedestals had been broken off. Much of the field iron was damaged and all the field coils were bent, broken and distorted. Half the armature iron had spun off and many of the commutator risers had been pulled from the bars. Nevertheless it was thought that the motor could possibly be rebuilt in a month and a half at nearly the cost of a new motor.

Upon getting the go ahead signal, Russ put his men to work on a 24 hour basis. Coils, poles and brush-rigging were stripped from the frame, and the bedplate was sent out with the bearing pedestals to be welded and machined. In the meantime, poles were put into presses and reshaped. Series and commutating field coils were straightened and reinsulated. Shunt coils had to be scrapped and replaced with new ones. Some armature iron and a complete set of armature coils were rushed in. The commutator was trued up and risers resoldered.

By this time the bed plate and pedestals had been returned. Field coils, brush rings and rigging were then installed, connections made, armature inserted, completely lubricated and tested. It was shipped out just 21 days from the day it came into the shop.

The motor had both an overspeed device and a field failure relay.

With reference to the record rebuild time, Russ said, "It was just one of those jobs where every piece just seemed to fall into place. Many another job not nearly so bad has given us much more trouble."



**EASY HANDLING** of crated armatures, motors and other repaired parts is provided by letting a board on each side of the crate overhang the ends far enough to permit a sling to be easily attached or to permit two or more men to carry the crate. This simple and thoughtful measure is a feature of all repair jobs crated and shipped by the Mielke Electric Works, Inc., Duluth, Minn., motor repair shop. They make their own crates to suit the job at the Mielke shop.



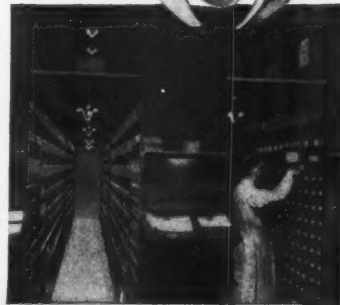
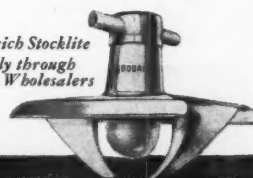
## HOW TO MAKE A STOCK BIN FUMBLE-PROOF!

Now is no time for fumbling—for wasting precious minutes when manpower is short—no time for mistakes. Stockroom illumination is below par when "second looks" are needed to read small print or identify parts numbers.

The proved way to faster, more accurate handling is with the fixture designed for the purpose. The Goodrich Stocklite illuminates shelves uniformly from top to bottom row—gets the light into bin interiors where you need it. It enables stock clerks to work faster—to fill orders *right* the first time. And it does it without glare in the aisles to cause eyestrain and fatigue. Write for Bulletin 91.



The Goodrich Stocklite  
Sold only through  
Electrical Wholesalers



**GOODRICH**  
ELECTRIC COMPANY  
OFFICES IN ALL PRINCIPAL CITIES  
GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

# Modern Lighting

## MERCURY VAPOR AND FLUORESCENT LIGHTING

Mercury-vapor and fluorescent lighting units are combined in a staggered pattern to furnish the quality of illumination desired in two aircraft plants designed and built by the Austin Company for the Boeing Aircraft Company.

Both plants were originally designed for daylight, with sawtooth roofs over major production areas, monitor roofs over warehouse and processing sections and continuous bands of sash around all sidewalls. One plant, in the west, has been blacked out completely and functions day and night without benefit of sunlight; the other, in the midwest, takes full advantage of its daylight design.

Illumination in both plants is provided by 400-watt, high-intensity, mercury-vapor lamps in high bay reflectors in combination with white fluorescent lamps in conventional porcelain enamel reflectors throughout the wide-span assembly areas, where a mounting height of 45 feet has been maintained.

Design features reported before the

Cleveland, Ohio meeting of the American Institute of Electrical Engineers and the Illuminating Engineering Society by C. F. Prideaux, Electrical Engineer, The Austin Company, show that, in the western plant, the mercury units are alternated in a diamond pattern with fluorescent units consisting of two, twin 100-watt fixtures, on a spacing 15-ft. by 16½-ft. Although designed to provide a minimum of 25 foot-candles, lightmeter readings have consistently shown between 35 and 40 foot-candles.

In the midwestern plant, approximately the same result has been obtained by alternating 400-watt mercury-vapor units with fluorescent units consisting of four 3-tube sections carrying a total of twelve 40-watt white lamps. The rows of units, in this plant, are spaced 21 feet apart and run lengthwise of the building, parallel with the monorail supports.

High intensity mercury and fluorescent combination lighting systems have been a natural choice in many plants where the character of production requires mounting at extreme heights.



**QUALITY LIGHTING** with high intensity mercury-vapor and fluorescent units in a combination pattern speeds production in this midwestern Boeing Aircraft Company plant. Rows of units spaced 21 feet apart contain both types of fixtures on alternate spacing. Maintained intensity is approximately 35 to 40-foot-candles.

Although high intensity mercury units do not give off as much heat as filament lamps, they radiate enough to increase the refrigerating load over that required in air-conditioned plants with 100 per cent fluorescent lighting installations.

## LIGHT CONDITIONED WAR PLANT OFFICE

Light conditioning is a term that goes hand in hand with air conditioning when considering working and production efficiencies both in the manufacturing and office areas of modern war plants. Good lighting adds to physical comfort and contributes to eye-ease.

The war plant office illustrated below has an average of 37-foot-candles (measurements made seven months after installation) of cool, evenly diffused fluorescent illumination on the working plane provided by approximately 134 ceiling type units. Each fixture is equipped with three 40-watt,



**LIGHT CONDITIONED** with fluorescents, this middle west war plant office assures top efficiency in handling the mass of paper work involved in war-time production.

3500 degree white fluorescent lamps and a diffusing glass shield. The total lighting load for this particular area averages 2.2 watts per square foot.

Units were installed end to end in rows on 10-foot centers and mounted 11-feet above the floor. The continuity of the row pattern was maintained by mounting single units to the underside of air ducts which ran full length of the office area. Efficiencies of the lighting installation were increased by painting the walls light buff.

## ALUMINUM PLANT LIGHTING

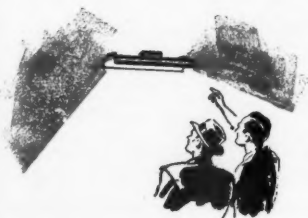
Illumination of the new Aluminum Company plant—DPC in New York City—is provided exclusively by stag-

It saves scores of tenanc headac rescent FLEUR FIED—



35 leading FLEUR- fixtures Mazda of a FL standard parts — Inc., of

"When it comes to  
warplant lighting ...  
this label tells  
me what I want  
to know!"



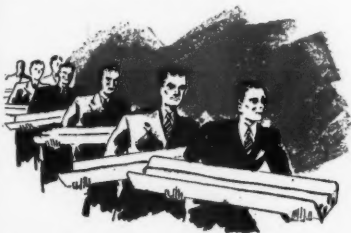
It saves a score of questions. It saves more scores of manhours and money in maintenance. And it can save production headaches. Because this label on a fluorescent lighting fixture means it's a FLEUR-O-LIER ... TESTED—CERTIFIED—GUARANTEED!



Then checks are made at quarterly intervals by an E. T. L. inspector who visits the factory of each participant.



FLEUR-O-LIERS conform to all WPB conservation orders. They're available only with suitable priority rating. Whenever warplant fluorescent is indicated, be sure to specify fixtures bearing the FLEUR-O-LIER label.



35 leading fixture makers participate in the FLEUR-O-LIER program ... build their fixtures to rigid standards set up by Mazda lamp experts. Every single part of a FLEUR-O-LIER is tested to those standards, and Certified by impartial experts—Electrical Testing Laboratories, Inc., of New York—at the beginning.



Starters and ballasts have their own Certification tests to make sure you get high power factor and reliable operation. The result? You don't have to test either the whole or any part of a FLEUR-O-LIER again. The LABEL tells you it's right.



Write NOW for new booklet containing complete FLEUR-O-LIER engineering specifications. You'll want them for ready reference when you specify lighting equipment. With them you'll get the FLEUR-O-LIER story and list of manufacturers. Address FLEUR-O-LIER MANUFACTURERS, 2122-8 Keith Building, Cleveland 15, Ohio.

# FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements



*Ever Break  
a Socket?*

## To Avoid Troubles

hundreds of heavy industrials  
and shipyards are using our



**UICO**  
NO.  
**63310**

**IMPACT  
RESISTANT**

**BAKELITE  
SOCKET**

**This** All Canvas Bakelite Socket is built and proven to last three or four times longer than the ordinary socket. Such long-life dependability is especially essential now as it eliminates frequent reordering with accompanying priority problems and slow deliveries.



• **Write for  
details today on  
No. 63310 Bake-  
lite Socket.**

**THE ORIGINAL  
MANUFACTURERS  
of BAKELITE SOCKETS**

**UNION  
INSULATING CO.**

Factory: Parkersburg, W. Va.  
Sales Office: 27 Park Place  
New York City

*Modern  
Lighting*

[FROM PAGE 78]

gered 500-watt incandescent and 400-watt mercury except in the rectifier rooms. Lighting feeders are 115 volts secured from the 440-volt plant distribution lines through lighting transformers of varying capacities.

In the rectifier building, 20 foot-candles of maintained illumination is obtained from two 100-watt fluorescent

fixtures mounted at a 21-foot height. Fixtures are placed at right angles to the length of the building to provide a more even distribution of lighting intensity between rectifier units.

Three rows of fixtures spaced eight feet apart are hung on 12½-foot centers. Lighting maintenance, which entails cleaning of fixtures and replacement of lamps, is facilitated by the overhead crane running the full length of each rectifier building.

In the main plant, staggered mercury and incandescent fixtures flood the working area with an even high intensity of



**RECTIFIER BUILDING ILLUMINATION** is provided by three rows of 2 100-watt fluorescent fixtures which are placed perpendicular to the length of the building. In this manner a more even intensity of light is obtained between rectifier units.



**PLANT ILLUMINATION** is secured by the use of staggered mercury and incandescent units. Messenger wire hanging is used to support both the fixtures and the open-wired-circuits.

# THE EXECUTIVE WHO STOPS TO THINK . . .



## *Knows that "10% for War Bonds isn't enough these days"*

Workers' Living Costs going up . . . and Income and Victory Tax now deducted at source for thousands of workers . . .

Check! You're perfectly right . . . but all these burdens are more than balanced by *much higher FAMILY INCOMES for most of your workers!*

Millions of new workers have entered the picture. Millions of women who never worked before. Millions of others who never began to earn what they are getting today!

A 10% Pay-Roll Allotment for War Bonds from the wages of the family bread-winner is one thing—a 10% Pay-Roll Allotment from each of several workers in the same family is quite another matter! Why, in many such cases, it could well be jacked up to 30%—50% or even more of the family's *new money!*

That's why the Treasury Department now urges you to revise your War Bond *thinking*—and your War Bond *selling*—on the basis of family incomes. The current

War Bond campaign is built around the family unit—and labor-management sales programs should be revised accordingly.

For details get in touch with your local War Savings Staff which will supply you with all necessary material for the proper presentation of the new plan.

Last year's bonds got us started—*this year's bonds are to win!* So let's all raise our sights, and get going. If we all pull together, we'll put it over with a bang!

This space is a contribution to America's all-out war effort by

ELECTRICAL CONTRACTING



you've done your bit  
... now do your best!



## LEVOLIER SWITCHES

FOR

F. H. P.  
Motors

Individual  
Light  
Control

No. 41-B



The New No. 41-B Levolver Switch with plastic casing, steel lever, nut and chain, is a compact, sturdy, easy to wire unit. Individual Light Control makes it an ideal power saver. Economical, trouble-free.

The No. 1010 is a 10-amp., 125-volt, lever-controlled switch, with plastic casing, and listed by the Underwriters with a "T" rating; capable of taking an initial surge of 80 amps, or 8 times its rated capacity. Dimensions,  $\frac{3}{8}$ " thick, by  $1\frac{1}{4}$ " diameter. Can be had with 7' cord, chain with bell ends or plain lever.



No. 1010

ELECTRICAL DIVISION

**MCGILL**  
MANUFACTURING CO.  
VALPARAISO, INDIANA



[FROM PAGE 80]

illumination. Messenger wire is strung the full length of the building and is supported every 19 feet on the building overhead structure. With one or two exceptions, open wiring is used throughout. Strings of insulators are dropped every 19 feet from the messenger cable to carry the lighting circuits.

Fixtures are mounted 25 feet from the floor and 19 feet apart. Longitudinal centers are 19 feet. Overhead cranes make maintenance an easy procedure.

### COMPARISON OF MAINTENANCE COSTS

From the records of Sweeney Tuck, plant electrical engineer for Northrop Aircraft, Allen Gaetjens of General Electric's Nela Park department has made a study of the comparative costs in the *Magazine of Light* of maintaining fluorescent and filament lighting systems in the same plant. The zone 17 referred to is a manufacturing area for radio.

The cost of cleaning and relamping a reflector for a 500-watt Mazda C lamp at a 12-foot mounting height is given as \$0.09; for a two 100-watt Mazda F reflector at a 13-foot mounting height the cost is given as \$0.19. In the fluorescent fixture presumably both lamps are replaced at one time.

Let us assume that the two installa-

tions are subject to the same hours usage and the same degree of dirt depreciation. It requires seven 2 100-watt fluorescent units to give approximately the same amount of light as six 500-watt filament units. 750 hours is the relamping period for the filament system and 2500 hours for the fluorescent system.

In 7500 hours (10 relamping periods for the filament system) the cost of cleaning and relamping 6 filament reflectors will be  $\$0.09 \times 10 \times 6 = \$5.40$ . Over the same period the fluorescent system would be relamped 3 times. The cost of cleaning and relamping 7 fluorescent reflectors would be  $\$0.19 \times 3 \times 7 = \$3.99$ .

However to clean the fluorescent system as frequently as the filament system would require seven auxiliary cleanings. (In practice there should be six auxiliary cleanings, or two cleanings per relamping. However, in the comparison, seven cleanings were assumed.) The average cost for cleaning (in Zone 17 fluorescent lighted) is 20 man-hours compared to 64 for cleaning and relamping. Thus the average cost per cleaning only is  $\$0.19 \times 20/64 = \$0.06$ . Over the 7500-hour period for seven reflectors this would be  $\$0.06 \times 7 \times 7 = \$2.94$ . The total cost of maintaining the fluorescent system is then  $\$3.99 + \$2.94 = \$6.93$  or approximately 30 percent more than the cost of maintaining to the same extent a filament system of equal foot-candles, mounting height and degree of dirt accumulation.

Of course, if the fluorescent system is installed in a clean location and the incandescent in a dirty one, or vice-versa, the figures would be radically changed.



**FLUORESCENT LAMPS**, alternately daylight and white, provide shadowless, glare-free illumination of even intensity at 60 foot-candles on working levels. The installation was made in the new engineering and drafting rooms at the Westinghouse plant in Emeryville, Calif. Twelve hundred feet of 40-watt tubes were mounted in continuous rows 11 feet from the floor and  $3\frac{1}{2}$  feet apart.



# This CONSERVATION PLAN

*will help you*

SAVE MAN-HOURS...

SAVE MATERIALS...

SPEED PRODUCTION

## 3. Conserve

by utilizing available facilities for preventing breakdowns and reducing machine outages.

### EXAMPLE

"Maintenance Hints"—a complete, pocket-size manual covering recommended upkeep practice for electrical apparatus—is a maintenance help available without charge. Check your Westinghouse representative for copies.



## 1. Conserve

by strategic selection, application and use of electrical equipment.

### EXAMPLE

Standard gearmotors or speed reducers save materials required by sheaves, belts, chains and line shafts. In addition, they commonly effect power or energy savings up to 10.5%.

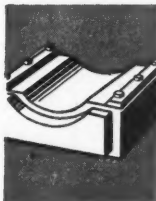


## 4. Conserve

by utilizing materials which in many cases can replace critical materials and do a better job.

### EXAMPLE

Micarta, a heavy-duty industrial plastic, outwears other materials in many bearing applications. Typical of many uses are steel mill roll neck bearings and marine stern tube and pintle bushings.



## 2. Conserve

by utilizing new developments that reduce need for critical materials and man-hours.

### EXAMPLE

X-ray inspection detects defective castings or welded sub-assemblies before they are machined or assembled. It replaces "destructive" tests... reduces rejects... eliminates wasted machinery man-hours.



## 5. Conserve

by tapping all sources of salvageable scrap.

### EXAMPLE

Systematic planning can uncover many ways of reclaiming worn equipment and waste material. Samples of salvage forms and organization charts in use in Westinghouse plants will gladly be made available on request.



Wartime Conservation means MORE than just conserving copper, steel, aluminum... it means the most strategic possible use of all of the ingredients of Victory—materials, man, power, time and ingenuity.

These five major points comprise a complete program developed by Westinghouse for War-time Conservation. This program packages up Westinghouse engineering experience in the entire field of electric and power equipment and related materials. Examples noted are but five of many specific recommendations.

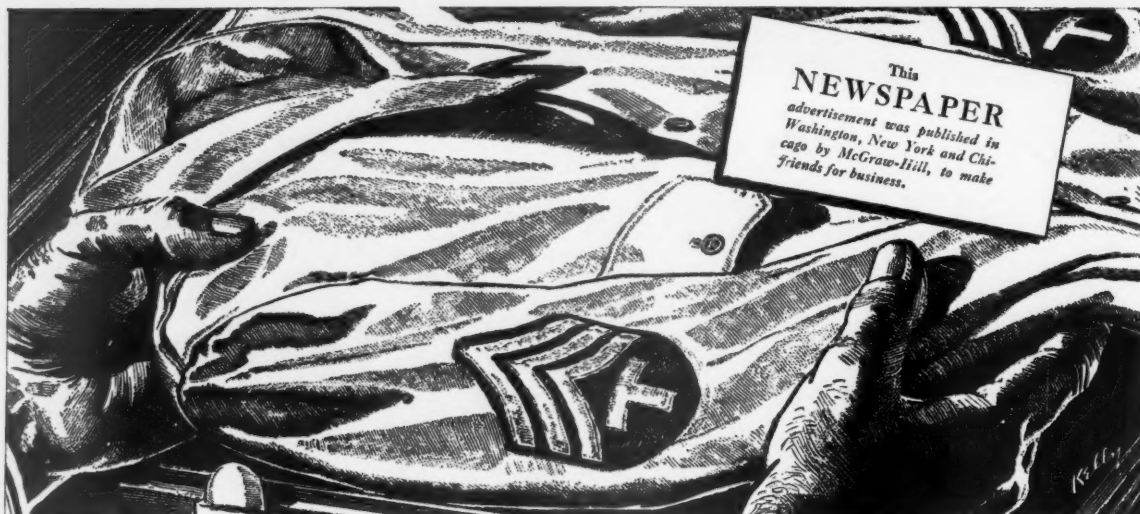
This experience and these recommendations are offered fully and without obligation.

Ask your Westinghouse representative today for a copy of the new 100-page book, "WAR-TIME CONSERVATION." Or write direct to Dept. 7-N, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

J-00481



**Westinghouse**  
PLANTS IN 25 CITIES... OFFICES EVERYWHERE



## When the Stripes are in the Attic . . . A NEW BATTLE WILL BEGIN

### *Sound Democracy is Based on Public Understanding*

The purpose of this advertisement—and of the messages which have preceded it in newspapers in New York, Chicago, and Washington—is to build a better understanding of the importance of Industrial Progress.

America was built on industrial progress. Victory for our armies would be impossible without our unparalleled industrial strength. Our post-war future will be shaped by it. But to maintain this industrial strength we must have the intelligent cooperation of every citizen.

In a democracy, where all have a voice, all must understand.

Fortunately, we have all the facilities with which to accomplish this educational job. American businesses, large and small, can do their share. Through their local press and other means they can educate the people in their own communities to an understanding of the inescapable fact that we cannot hope to solve our Home Front Problems—now or post-war—unless the productivity of each and every American is increased.

It is our hope that this McGraw-Hill Campaign will contribute to this understanding and provide the "educational yeast" for others, so that every industrial community can receive essential insight into the part that a sound industry can play in assuring good living.

Free newspaper mats of this and other advertisements of the Campaign are available to those businesses who lack facilities for telling their own story in their local press. Space is provided, in these mats, for the signature of the local sponsor.

*James H. McGraw, Jr.*  
President

McGraw-Hill Publishing Company, Inc.

WE were thinking about a soldier named Tim the other day . . . but not in a sticky, sentimental sort of a way.

We were just thinking about the office boy who'll come home a trained technician.

You see, we'll owe Tim a job when he gets back. But how the heck are we going to fit a man who has kept a Flying Fortress in fighting trim back into the minuscule responsibilities of sealing letters and running errands?

Obviously, we've got to figure out a wider scope for a Tim who has learned a great deal, not only about machines, but about people.

And how about the girl who has Tim's old job? She is doing all right. Maybe she will get married and quit work when the war is over . . . but then again?

See how our thoughts were running? Two jobs to provide where only one job existed.

► If you run a business, or a department, you know the next step in our thinking by heart. Multiply Tim by the number of employees that are in the services, or in government jobs, and add the new people that now have their old jobs, and you will see that this nation faces the greatest opportunity in the history of the world.

If we live up to that opportunity, we will not have 10,000,000 unemployed, with their wonderful training going to waste. Instead we will have a country humming with the released energy of its whole people.

**[FREE MATS:** If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18), N.Y.]

## When the Stripes are in the Attic . . . A NEW BATTLE WILL BEGIN (cont'd)

What are we going to do about providing 10,000,000 new jobs when the uniforms are in the attic?

That will be the peacetime battle, and thousands of civilians are now planning its strategy and tactics.

Fortunately, there is a better way to use the energy and skill of our fighters and war workers than putting them on ambition-killing government jobs in some super W. P. A.

American Industry is the best outlet for personal energy and skill.

If you doubt that, remember that our modern industry is little more than 50 years old.

In that short time it has provided more good living for more people than all the centuries and milleniums that went before.

American Industry can give good jobs to every skilled and energetic person who wants to work.

How? By extending the process that produced so much good living for so many in the years gone by.

► If that is true, then everybody should understand how industry works, so that the growth of industry can be encouraged.

The purpose of industry is to get more work done in less time.

The life of industry is improvement.

When products are constantly improved (either in appearance, service or price) more and more people buy them. That makes jobs.

When there is no industrial improvement, you have a country with living standards like those in China, or India.

When there is slow industrial improvement, you have a country like, say, one of the Balkan states.

When there is rapid industrial improvement, you have a country like ours, with the highest living standards in the world.

We haven't always understood this, and so we have had periods when there was little new ma-

chinery and improvement in plant. That helps cause depressions.

But, remember that the plants which made electric refrigerators, radios, air conditioning and streamlined trains supplied good jobs during the last depression, because those were *improved* products which people bought in spite of hard times.

► We don't need to worry about creating 10 million new jobs, if we give our nation of Eli Whitneys a chance to do their stuff.

Why do we say "give them a chance"?

Because the only chance industry has to improve is through its Seed Money.

As you know, Seed Money is that part of profit which is "ploughed back" into a business in improved factories, machines, methods and products.

As you also know, a very great amount of Seed Money is being taxed out of existence.

We don't think it makes much sense to stunt the growth of industry at a time when 10 million new jobs will be needed, do you?

If you think Congress should look into this matter of providing better conditions for industrial growth, tell your Congressman how you feel.

*"Industrial Progress  
is the Source of all Good Living."*

### THE MCGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

24 publications, which gather "war-news" from the "war-production-front" through a staff of more than 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

#### MCGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

*This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, \$1.00 per 100; \$10.00 per 1000.)*

## MCGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK (18), N. Y.

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Business Publishers International Corporation, an affiliate, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation



# Questions ON THE Code

Answered by

**F. N. M. SQUIRES**

Chief Inspector New York Board of Fire Underwriters

## Time-Lag Fuses for Smaller Fuse Clips

**Q.** "Are we permitted to use motor switches with smaller clips to accommodate fusetrans? Plain fuses cannot handle the flywheel load as well as fusetrans when a low slip induction motor is used, and the motor slows down to about 50 percent speed for a short time. This overload does not hurt the motor or switch if the switch is properly made, but it blows the fuses.

I believe that twenty-five years is a good record for a 30 ampere switch controlling a 5 hp. motor with the original set of switch contacts, and at least for the duration, electricians should get a chance to protect motors against overloads by using fusetrans.

I would appreciate your advice as to what to do under these conditions."—H.S.

**A.** The Code now permits just what we understand our inquirer is asking for. Section 4347 states "that when the conditions of maintenance and supervision provide that appropriate fuses for the starting characteristics of the motor will be continuously available, fuse holders of smaller size than those specified by Section 4342 may be used."

Note, however, that the above refers to fuse holders and not to switches. In all cases where switches rate in horsepower are required by the code, the switches selected must have the appropriate horsepower ratings but the fuse holder parts of the switches may be of lower ratings to accommodate the smaller fuses when the time-lag fuses are used, provided the inspection authority having jurisdiction is satisfied that the maintenance and supervision of the job will assure a continuously available supply of the proper size fuses.

Of course this does not mean that refillable fuses with doubled up links may be used.

In many cases the application of Section 4347 quoted above, will result in the use of smaller fuse holders, for instance, the use of 30 amp. fuse holders where otherwise it would be necessary to use the 60 amp. fuse holders for use with the plain or non-time-lag fuses.

## Painting Meter Boards

**Q.** "Where I mount the meter and service equipment and distribution panel on a wooden board in the basement of a house, does the Code require that I first paint the board?"—R.S.

**A.** Some few years ago when it was permissible to mount switches and cutout boxes in the open without enclosing them it was customary to mount them on wooden panels and practically all inspection authorities re-



**KENTUCKY INSPECTION** of electrical wiring is handled by the State Electrical Inspection Bureau. Two of the staff shown here are (L to R) E. H. Rueppel, Chief Deputy Electrical Inspector, Louisville; and W. H. Waller, Hopkinsville, Kentucky.

quired that the wooden panels be painted with a waterproofing fireproof paint. This was in the good old days of the liberal use of "P.B."

This custom of requiring the painting of the boards, especially meter boards with the black asphaltum persisted for many years, and in some instances up to the present day. However, the Codes for many years back have required the enclosing of service equipment, switches, cutouts, etc., in approved enclosures. (For instance see Sections 2381, 2436 and 3803) and with the requirements for enclosures the Code has not had requirements for the painting of a board on which the enclosure may be mounted.

## Service Drop

**Q.** "There is a two wire 110 volt service drop supplying current to a building. The owner now desires to use a 220 volt motor in this building. Can I use this two wire service drop to supply 220 volts to this building for a motor?"—B.B.

**A.** If both of the wires of the service drop are rubber insulated, this drop may be used for 220 volts. Of course this would not provide a neutral so that no 110 volt equipment, either of 110 volt motors or lamps could be used.

## Cable Problem

**Q.** "I am wiring some barracks which consist of concrete block outside walls with 1-in. by 2-in. furring and wall board finish with non-metallic sheathed cable.

I am aware of Section 3362 of the Code and also Interpretations 185, 187 and 220. I thought the Code was pretty clear until I read those interpretations which now give me some doubts.

Is there anything wrong with installing non-metallic sheathed cable on the inside face of the concrete blocks in the open space created by the 1-in. by 2-in. furring strips and behind the wall boards?

In barracks, where dormitories are located at or below bunk heights it does not seem to me as the best method of wiring to use exposed cable. I therefore like to use concealed work.

Such concealing of the cable does not involve embedding in masonry, concrete, fill, or plaster, but will you please let me know what there is against it?"—T.F.S.

**A.** This rule has caused considerable confusion which, of course, prompted the questions which received official interpretations.

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NATIONAL ELECTRIC PRODUCTS

TO KEEP AWAY FROM RUST...  
TO KEEP WIRING SAFE...RIGID  
STEEL CONDUIT-SHERARDUCT

WIRING SYSTEMS  
WIRES AND CABLES

NATIONAL ELECTRIC PRODUCTS CORP.  
SPELLERIZED  
SHERARDUCT  
SCALE-FREE  
PITTSBURGH, PENNA.

UNDERWRITERS' LABORATORIES, INC.  
INSPECTED  
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# BUY THE FLUORESCENT LIGHTING WITH THIS EXTRA SAFETY FEATURE!

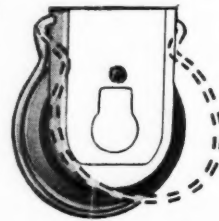
**T**AKE a good look at the little sketch below. It shows an exclusive feature of MILLER AERO-DESIGNED fluorescent lighting — a patented safety lamp lock that minimizes the danger of lamps falling.

It's a very important feature to any man investing in fluorescent lighting today.

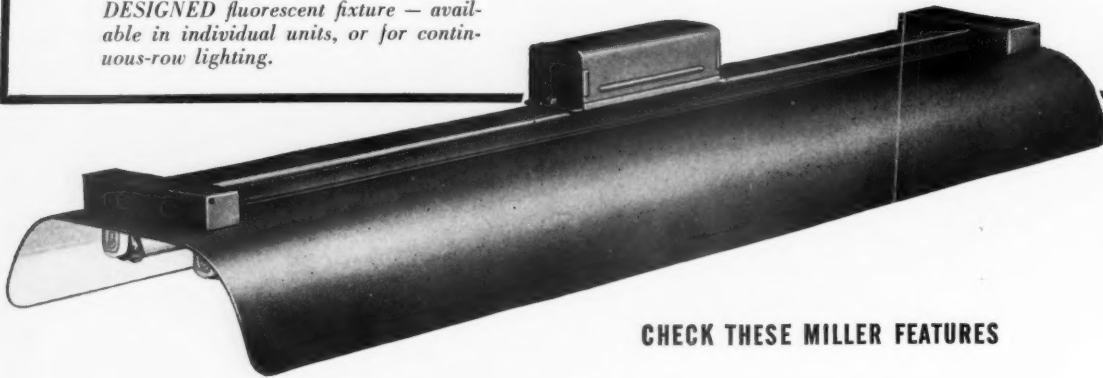
This patented safety lamp lock is an integral part of each socket, simple in operation and foolproof. It's a MILLER

"extra" — and your protection against costly plant accidents.

Other noteworthy features of MILLER AERO-DESIGNED fluorescent are itemized below. Check them carefully, then call in a MILLER field engineer (located in principal cities) for a talk about your plant lighting.



*Here's the rugged new MILLER AERO-DESIGNED fluorescent fixture — available in individual units, or for continuous-row lighting.*



## CHECK THESE MILLER FEATURES

**R**EFLECTORS are of Masonite with durable IVANITE, the "sealed-in-surface" finish for high reflection factor. Lightweight, easy to remove, simple to clean. Reflectors are "extra length" for good shielding of lamp ends. Miller reinforcing reflector attachment strap assembly is an integral part of each reflector—no change required for either two or three-light units. **WIRING CHANNELS**, now streamlined, contain all necessary wiring and auxiliaries—with ballasts exposed for heat dissipation. Can be used as individual lighting units or in continuous rows.

**FLANGED TOP** of channel permits clamp strap attachment at various points along channel, for ceiling, rod or cable mounting to suit any ceiling structure. Also can be suspended with chains, conduit or combinations of these methods.

**MILLER SAFETY SOCKETS** with integral safety lock to prevent lamps from falling are rigidly spaced and substantially mounted.

**FIXTURES** carry both Underwriters' and RLM Standards labels — are backed by written warranty and MILLER'S almost 100 years of lighting experience.

## THE MILLER COMPANY • MERIDEN, CONNECTICUT

**ILLUMINATING DIVISION**  
Fluorescent, Incandescent  
Mercury Lighting Equipment

**OIL GOODS DIVISION**  
Domestic Oil Burners  
and Liquid Fuel Devices

**ROLLING MILL DIVISION**  
Phosphor Bronze and Brass  
in Sheets, Strips and Rolls

**WAR CONTRACTS DIVISION**  
War Material





Interpretation No. 220 gives us the answer to this particular question. This states that the installation of non-metallic sheathed cable in a rough chase in a concrete block wall does not violate Section 3362.

Certainly, then, if the cable can be installed in a rough chase in the block it can be installed in the dead air space between the concrete block and a wall board wall. We see no objection to it for if there was sufficient dampness to bother the cable it would raise havoc with the wall board.

### Socket Ratings

**Q.** "In Canada, Provinces have autonomy in the matter of code for electric wiring but work under a joint committee called the Canadian Engineering Standards Association.

"One of the rulings adopted has been that a socket must have a rating of 660 watts. In the United States the socket universally used, has a rate of 250 watts. This has the approval of the National Board of Fire Underwriters. I would like to ask you to ascertain if possible, why the Underwriters in the United States think the 250 watt socket is satisfactory. We have been having quite an argument with the Board in order to secure a ruling in Canada that such a socket is in conformation with the Code and this information will materially assist us."—J.M.S.

**A.** The writer does not feel that he should enter into any controversy relative to any of the Canadian rules and believes that your proper redress is with the Committee which promulgates the Canadian Electrical Code.

As a justification of our own rules however, we will offer the following comments:

The National Electrical Code has recognized 250 watt medium base sockets since at least the 1913 Code. One of the tests for sockets at that time and ever since, has been with 150 percent of rated load at rated voltage. Underwriters' Laboratories have listed only such sockets as meet this test among many other tests.

There has been trouble with fibre socket linings where sockets were used in such a manner as to be subjected to excessive heat, the sockets otherwise have given satisfactory service when used with lamps which do not exceed the normal rating of the sockets. Therefore, the 250 watt sockets are considered safe for their intended use.

## OFFICIAL INTERPRETATIONS

by the

Electrical Committee of the N.F.P.A.

### Interpretation No. 243

**Statement . . .** In an industrial plant, power is supplied at 230 volts, 3-phase ungrounded, except for the equipment ground at the service entrance.

**Question 1 . . .** May 2-wire lighting circuits using 230-volt lamps, with fixtures mounted more than 8 feet from the floor, with Mogul-base lampholders and double-pole switch control not integral with the fixture, be used?

**Answer 1 . . .** Yes, as an emergency and in view of Interpretation No. 229.

**Question 2 . . .** May medium base lamp sockets be used under the above conditions?

**Answer 2 . . .** Yes, but only on a 15-ampere lighting branch circuit.

**Question 3 . . .** Would this use of a 230-volt ungrounded branch lighting circuit (with 230-volt lamps) be permitted if fixtures were not mounted 8 feet from the floor, etc.?

**Answer 3 . . .** No, this is a war emergency finding in view of the spirit of Interpretation No. 229.

### Interpretation No. 243-a

**Statement . . .** In an industrial plant, power is supplied at 460 volts, 3-phase ungrounded except for the equipment ground at the service entrance.

**Question . . .** May branch lighting circuits utilizing 230-volt lamps in series between two phases at 460 volts be installed if the lighting fixtures are mounted more than 8 feet from the floor, have Mogul base lampholders and double-pole switch control that is not an integral part of the fixture?

**Answer . . .** A division of opinion within the committee does not warrant promulgation of a formal finding on this question.

### Interpretation No. 245

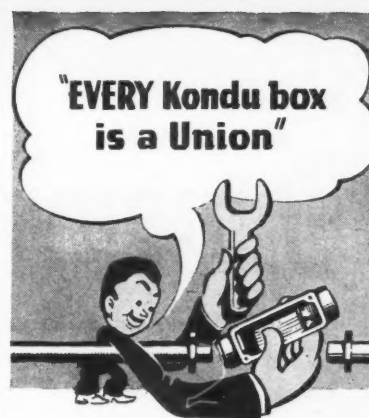
**Statement . . .** A magnetic starter for a 3-phase, 220-volt motor is located in a switch room. The start-stop button is located at the motor.

**Question 1 . . .** May the control wires between the start-stop button and the magnetic starter be run in the same raceway as the motor starter conductors?

**Answer 1 . . .** Yes, section 3013 of the 1940 edition of the Code applies.

**Question 2 . . .** May the conductor connecting the relay be in the same raceway with the motor circuit conductors?

**Answer 2 . . .** Yes, section 3013 of the 1940 edition of the Code applies.



**Just loosen two nuts,  
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out of the line**

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can be changed without disturb-  
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**Kondu is the only fitting that  
can be put in at a later date—  
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**KONDU CORPORATION**

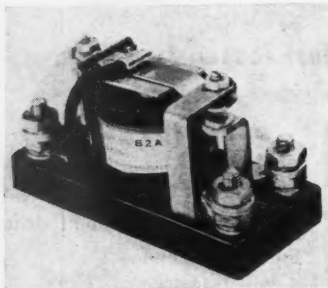
**Erie, Pa.**



THESE ANNOUNCEMENTS of new equipment are necessarily brief—for more detailed descriptions, sizes, prices and other data write to the manufacturers' advertising departments, tell them in what issue of **ELECTRICAL CONTRACTING** you saw the item and they will send full details to you.

# EQUIPMENT NEWS

## Relay

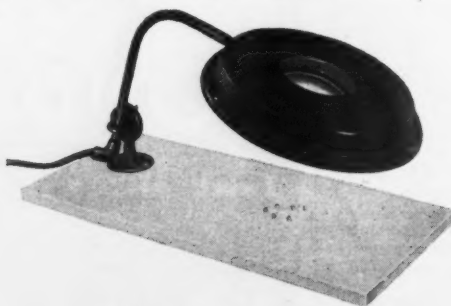


WARD LEONARD RELAY

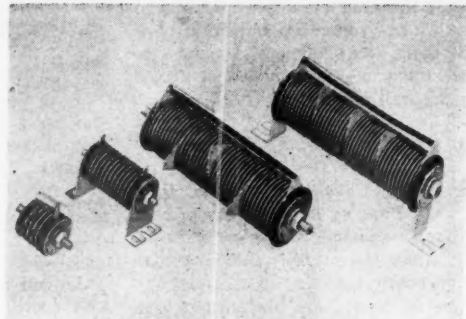
Bulletin 103 relay is designed particularly for aircraft power circuits. It will perform at high values of acceleration of gravity and also under conditions of vibration and shock. The armature and contact assembly are designed to retain either position under these conditions. The normally-open, single pole contacts are rated 25 amperes at 24 volts d.c. non-inductive load, with good characteristics on inductive loads. The contact gap and tail spring tension are adjustable. Molded Bakelite forms the base measuring 1½ by 3½-inches. Two holes are provided in the base for mounting. Ward Leonard Electric Co., Mount Vernon, New York.

## Inspection Light

This new dust-tight inspection light is a magnifying lens with auxiliary lighting and was designed for use in ordinance plants where open-type units were not acceptable. The unit consists of a steel housing 12½-in. in diameter and 2-in. deep and is furnished with a white Fluracite reflecting surface inside. All outside surfaces are finished in crackled gray. The magnifying lens is of the double convex type, 4½-in. diameter. The shatter-proof cover glass is lightly sanded for diffusion except for a clear spot 3¼-in. diameter directly under the lens. The swivel base and movable arm permits adjustment of the unit over the inspection plane for correct focusing of the objects to be inspected. It uses two 6-watt fluorescent lamps. Curtis Lighting, Inc., 6135 West 65th Street, Chicago, Ill.



CURTIS INSPECTION LIGHT



G-E SELENIUM RECTIFIER STACKS

## Selenium Rectifier Stacks

Selenium rectifier stacks have been added to the G-E Tungar and copper oxide rectifier line. Electrical characteristics have been improved so that a.c. is converted to d.c. more efficiently. Better forward current characteristics and low leakage are responsible for higher operating efficiencies between the a.c. input and d.c. output. Selenium stacks can be arranged to obtain higher current output by connecting the stacks in parallel and higher voltage ratings can be obtained by connecting the stacks in series. They can be bolt mounted or stud mounted directly to equipment assemblies. They are also available with mounting brackets of various types for convenient assembly to panels, etc. General Electric Company, Bridgeport, Conn.

## Fluorescent Fixture

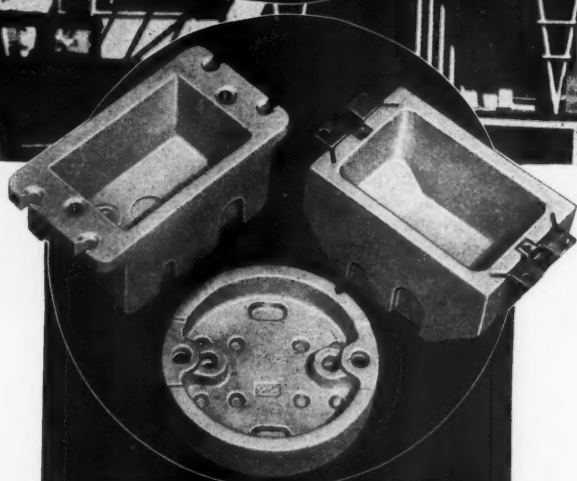
A new industrial type fluorescent lighting fixture has been developed. It meets the latest critical material weight requirements of WPB. The reflector is anchored to the top-housing with a pair of captive latches. Chain hanging ears on 43-in. centers, half-inch knockouts on 18-, 24-, 30- and 36-in. centers, channel for adjustable slide-grip hangers and knockout for levolver pull chain switch make installation speedy. Model HF-100R, using two 40-watt fluorescent lamps has an overall length of 49½-in., width of 13½-in. and height of 6½-in. Model HF-150R uses three 40-watt fluorescent lamps. Model HF-235R, using two 100-watt fluorescent lamps has an overall length of 61½-in., width of 16½-in. and height of 8-in. All units available for 110-125 volts or 220-250 volts, 60 cycle a.c. Sylvania Electric Products, Fluorescent Fixture Division, Ipswich, Mass.



SYLVANIA FLUORESCENT FIXTURE

# SHALLOW WALLS OFFER NO WIRING PROBLEM

IN  
CONSTRUCTION  
LIKE  
THIS



**PORCELAIN  
PROTECTED  
WIRING  
SYSTEMS**

**FOR**  
*Prefabricated*  
**HOUSING**

• Shallow porcelain outlet boxes have been developed and are now in wide usage for the wiring of prefabricated homes. Thus the problem of meeting the need brought about by shallow walls has been fully met. More than that Electrical Contractors have all the advantages of porcelain and aid in the Conservation of vital metals and rubber. Porcelain-or-non-metallic type-outlet boxes are required by all government directives and orders on wiring construction.

Because porcelain is a non-critical material, these shallow porcelain outlet boxes are available in numbers to meet all of your wiring requirements for prefabricated housing. They offer Prefabricators the same well known safety, permanency, simplicity of installation, economy, and insurance against maintenance as standard porcelain wiring products.

The companies listed below will be glad to cooperate with you in supplying your needs.

## MODERN PORCELAIN PROTECTED WIRING SYSTEMS



★ ILLINOIS ELECTRIC PORCELAIN CO.  
Macomb, Ill.

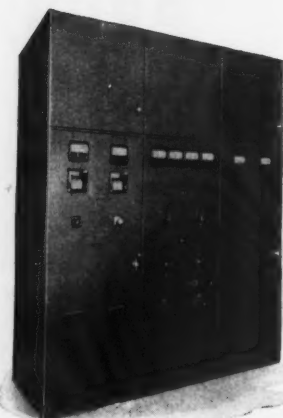
★ KNOX PORCELAIN CORPORATION  
Knoxville, Tennessee

★ PORCELAIN PRODUCTS, INCORPORATED  
Findlay, Ohio



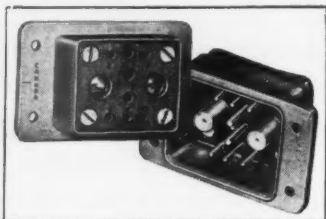
## Motor Starter

The Type H motor starter has been added to this industrial control line. It is a metal-enclosed structure similar to metal clad switchgear. High interrupting capacity disconnecting - type fuses are used in combination with a heavy duty oil switch. They have been developed for both induction and synchronous - type motors rated up to 1000 hp. at 2300 volts and 1750 hp. at 4600 volts, 3-phase, 60 or 50 cycles. The new starters protect motors from sustained overloads, locked rotor condition, single phasing and overloading caused by too frequent starting by means of thermal overload relay accurately calibrated. Allis-Chalmers Manufacturing Co., Milwaukee, Wis.



ALLIS-CHALMERS MOTOR STARTER

## Connector

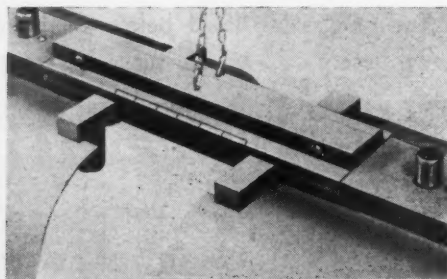


CANNON ELECTRICAL CONNECTOR

The DP-B10C2 electrical connector is a rack type connector and adapted to radio rack assemblies, transmitters and any general applications where both plug and receptacle must be fixed permanently in their respective units of equipment. It is rectangular and the shell is tapered. The insert insulation is made of molded phenolic, having eight standard contacts of brass, silver-plated and two coaxial contacts of the same material with isolantite insulators. Two contacts are 30 ampere and six are 15 ampere. Four mounting holes have diameter of .144 in. countersunk for No. 8 flat head machine screws. Cannon Electric Development Co., 3209 Humboldt Street, Los Angeles, California.

## Fluorescent Fixture

The new "5000 Line" of industrial fluorescent lighting fixtures has been announced. A new feature is the "Flexi-Coupler", a device which permits spacing of fixture units

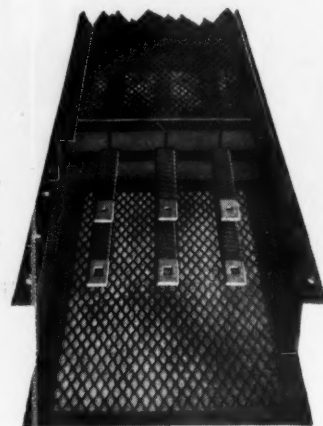


MARTIN-GIBSON FLUORESCENT FIXTURE

as much as six inches apart, but preserves all the features of a continuous-run installation. This line has the light weight channels, conforming to government conservation order. Non-metallic reflectors attain a high reflection factor of 89 percent to 91 percent, due to "Permaline" method of enameling. They are available in two 40-watt, three 40-watt and two 100-watt sizes. Martin-Gibson Company, 999 Harper Avenue, Detroit, Mich.

## Feeder Bus Duct

This redesigned feeder bus duct of the ventilated type has a screened casing of expanded metal in place of the solid metal casing formerly used. The screen casing gives low operating temperatures and increased current carrying capacities. The paired-phase busbar arrangement within the casing assures uniform current density through reduction of "skin effect" and "proximity effect." Available in the new WPB ratings of 800-, 1000-, 1350-, 1600- and 2000-amperes, single phase, 3 phase, and 4 wire 3 phase, 600 volts or less. It can be used for feeders alone or in conjunction with branch circuit plug-in type BUStribution duct. Bull Dog Electric Products Company, 7610 Jos. Campau Avenue, Detroit, Mich.



BULL DOG FEEDER BUS DUCT

## Transformers



G-E TRANSFORMERS

A new series of dry-type natural-draft transformers for indoor use on 600 volts and below, has been developed. The size and weight of the new transformers have been materially reduced, permitting lighter foundations and requiring less floor space. Ventilation has been improved by slanting louvered side plates inward at the bottom and top of the case. This permits a directed flow of air through the case vertically, entering at the bottom, passing through the coil ducts and out through the top louvers with little change in direction. It has a two-legged core with a high voltage coil and a low voltage coil on each leg. The core is clamped at its top and bottom, with the bottom clamps serving as mounting feet. Top clamps are used for lifting the transformer and serve as the upper bracket, if the unit is wall mounted. Unit can be mounted against a wall or close to other units with little effect on temperature rise. General Electric Company, Schenectady, New York.

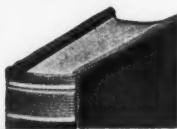
*An easy-study guide to*  
**Fundamentals of  
 ELECTRICITY**  
 and standard methods of  
**INDUSTRIAL WIRING**

This book offers the practical worker a thorough training in electrical wiring for every industrial application. It not only gives standard, economical and efficient methods for doing every type of wiring, but also gives the groundwork in electrical theory, action and application of apparatus, principles of lighting, power circuits, etc., needed for the most intelligent and effective handling of this work.

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**INDUSTRIAL  
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Formerly Instructor in Electrical Engineering, and Supervisor in Charge of Industrial Subjects, Division of University Extension, Massachusetts Department of Education.



541 pages, 283 illustrations and diagrams,  
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The book will take anyone right from first steps through to the ability to handle industrial wiring intelligently and effectively by approved methods. Everything is clearly illustrated by diagrams, charts and tables, and the practice described throughout the book is based on the 1940 National Electrical Code.

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Chapter describing fluorescent lighting equipment.

Chapter showing various causes of radio set interference, including fluorescent lighting, and their remedies.

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Splicing and Soldering Wires	and Generator Wiring
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Send me the Moyer & Wostrel's Industrial Electricity and Wiring for 10 days' examination on approval. In 10 days I will send \$2.75, plus few cents postage, or return book postpaid. (We pay postage if you remit with order.)

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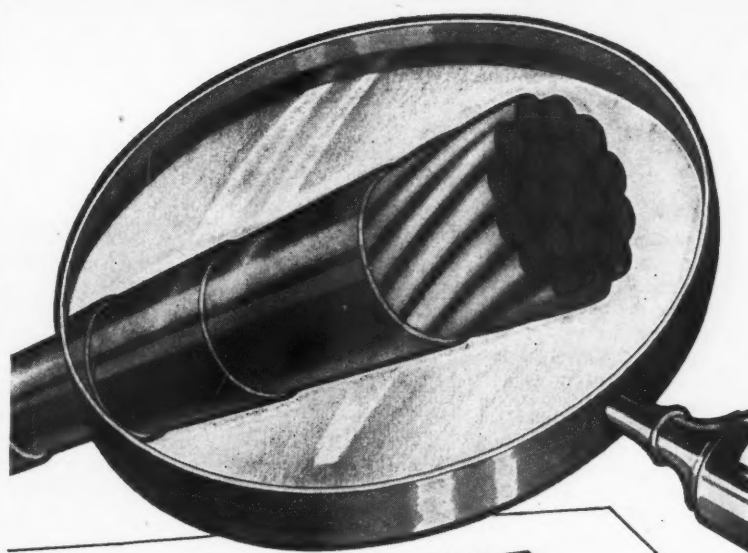
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Now, more than ever, performance depends on construction. Every step in the manufacture of Deltabeston Wires and Cables—from raw materials to the finished products—is painstakingly tested and inspected for better wartime service. We at Deltabeston have always insisted that the best was none too good for our fighting forces.

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Here's the answer to your wiring problems where heat prevails. It's yours for the asking. Just write to Section Y832-8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn. G-E Deltabeston Asbestos- and Glass-insulated Wires are distributed nationally by Graybar Electric Company, G-E Supply Corp. and other G-E Merchandise Distributors.

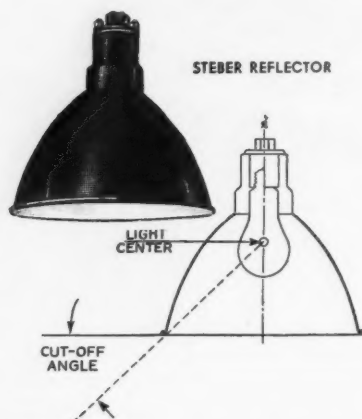
**GENERAL ELECTRIC**

## Motors

A new line of direct current vertical motors ranging from 40 to 200 hp. at 1750 rpm. and in equivalent ratings at other speeds, has been announced. They are furnished for both constant and adjustable speeds and are designed for low-thrust, solid-shaft applications on pumps, machine tools and marine under-deck auxiliaries. The motors are of dripproof, protected construction providing protection from dripping liquids and falling objects. A special bearing housing prevents grease from entering the motor. General Electric Co., Schenectady, N. Y.



G-E VERTICAL MOTORS



## Reflectors

This new line of deep bowl reflectors are particularly adapted to confine and direct light rays directly on work, to prevent light losses, and to reduce light leakage outside plants, barracks and other buildings. Reflectors are made in four diameter sizes—7½, 10½, 15 and 17½ inches. The shade holder types are made in several sizes for use with 60 to 200 watt lamps; and detachable socket types for use with 60 to 1500 watt lamps. Standard finishes are green exterior and either ultranamel or porcelain enamel interior. Steber Mfg. Co., 2451 N. Sacramento Ave., Chicago, Ill.

## Insulator

This new all-porcelain tree insulator has been designed as a replacement for wood tree wire protectors, tree wire and tree-anchored insulators. To install, the insulator is hung on the wire at the point of contact with tree or limb and the tie wires threaded through the two holes at each end of the insulator and twisted about the service wire, holding



PORCELAIN TREE INSULATOR

it securely in place. It will take wires up to one inch in diameter. They are available in 12, 14 or 16 inch lengths. The Porcelain Insulator Corporation, 432 Main Street, Lima, N. Y.

## Welders and Electrodes

A complete line of industrial a.c. arc welders has been added to this line of P&H d.c. machines. They are available in seven heavy duty and four intermittent duty models with a range of capacities for handling production welding under continuous operation. The new line features the recently adopted "WSR" (Welding Service Range) ratings which show the actual minimum to maximum output of usable welding current. Setting and control of current throughout welding service range involves one easy to operate adjustment.

A new all-position electrode has been designed especially for use with these a.c. transformer welding machines. Suited for all mild steel applications, it is being made in the usual sizes of ⅛, ¼, ⅜, ½ and ⅝-in. and 14- and 18-in. lengths, packed in standard 50-pound containers. Welder Division, Harnischfeger Corporation, Milwaukee, Wis.



HARNISCHFEGER WELDERS

## Searchlights

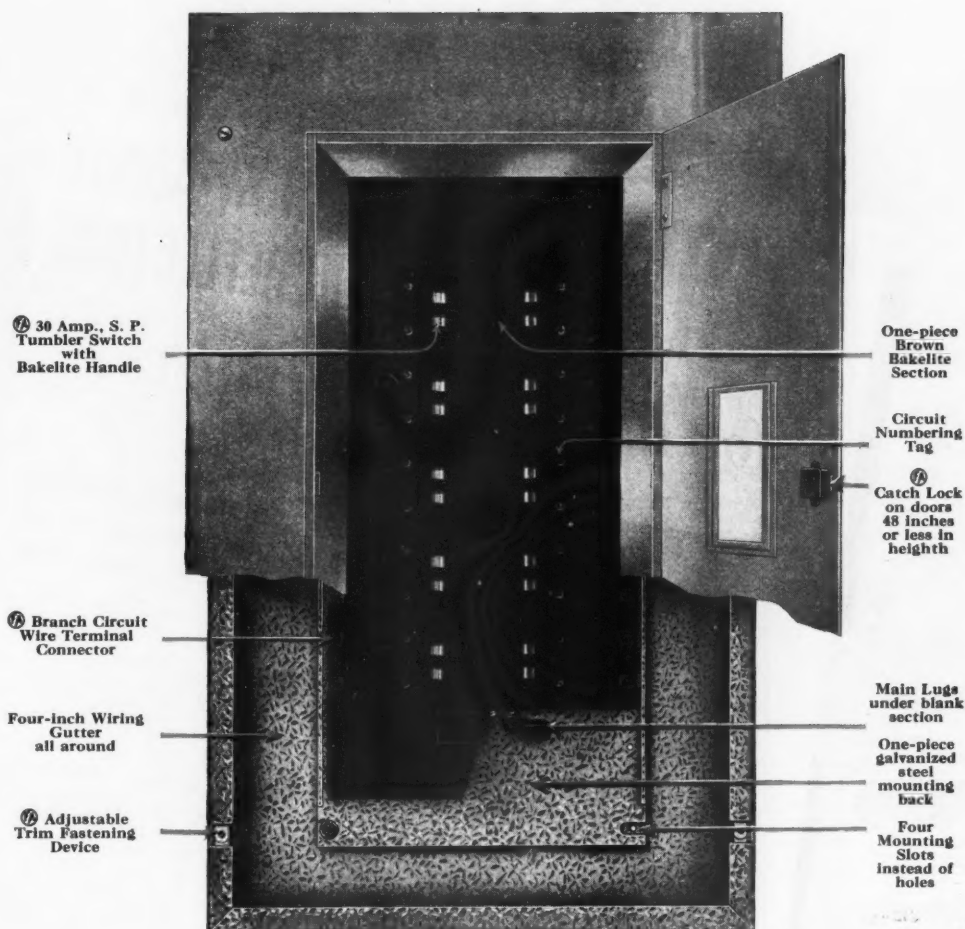
This new line of incandescent marine searchlights is designed for use on small or medium-sized ships. They are available in 12-, 18- and 24-inch sizes and a variety of mountings for installation at various shipboard locations. All units are weatherproof with front door glass fastened in place by continuous clamping ring and packing. A rear door equipped with a centered heat-and-cold resistant plastic handle gives access to interior for reclamping. The handle is also used for directing light beam. Mountings are available in pilot house control, high pedestal, low base and stanchion types. The 18- and 24-inch models are available also in high pedestal or pilot house control types with slipring electrical connections for continuous horizontal rotation. For continuous service, the 12-inch searchlight will take a 600-watt lamp, the 18-inch up to 1500 watts and the 24-inch up to 2000 watts. General Electric Company, Schenectady, New York.



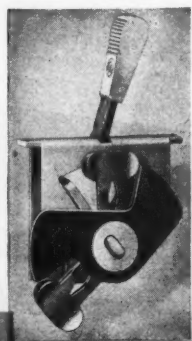
G-E SEARCHLIGHT



# This **FA** Lighting and Appliance Panelboard is *safety type* under all operating conditions



This shows the rugged yet simple design of the 30 ampere Tumbler Switch used in LNTIP Panelboards.



Each section is of Bakelite, *molded in one piece*. There are no removable covers to fall off or become loosened by tampering . . . All parts, including the switches, are applied from the rear . . . The switch frames, main contact members to bus, and the required rivets to secure other parts, are *molded into the section* . . . Screw connections have been reduced to the minimum to assure uninterrupted service. The connection between the main bus bar and the branch circuit switches is accomplished by means of a new design clamp contact, which also contains the branch circuit switch contacts as an integral part. Direct copper-to-copper contact is thus secured without the use of screws or other accessories.

Each section contains four 30 ampere; single pole, heavy duty tumbler switches, with plug fuse connections . . . Branch Circuit tumbler switches

are rated 30 amperes, 250 volts DC, and are of the quick-make, quick-break type, with double-break contacts.

Panelboards, for surface or flush mounting, are available with from 4 to 42 branches; with main lugs only, or with safety type main fuse disconnect, or Shutbrak safety type main switch. They are fully approved by Underwriters' Laboratories, Inc.

## Write for Bulletin 67

It contains complete descriptions, specifications, sizes, wiring diagrams, and prices . . . Frank Adam Electric Company, St. Louis, Mo.



# LOOK WHAT'S HAPPENED TO

**SINCE G-E MADE THIS  
ANNOUNCEMENT**

## **FACTS** YOU SHOULD KNOW ABOUT *NON-METALLIC REFLECTORS for Fluorescent Fixtures!*

General Electric has this announcement in electrical magazines in January 1943, showing sample fluorescent fixtures made to comply with WPB restrictions on metals.



Fluorescent fixtures bearing either of these two labels are made to rigid specifications for mechanical, electrical, and illuminating excellence, and are tested and certified by impartial experts, Electrical Testing Laboratories, Inc. of New York. You can depend on fixtures bearing these labels.

Here the General Electric radio programs: "The How of Chem," Sunday, 10:00 p.m., E.W.T., NBC; "The World Today," News, each weekday, 6:45 p.m., E.W.T., CBS.

W.T. WAS. 100000



**EFFICIENT NEW REFLECTORS  
RELEASE TONS OF STEEL FOR  
OTHER WAR PRODUCTION**

**I**ntensive work by the lighting industry now has developed non-metallic reflectors for fluorescent lamp fixtures. They are efficient, light in weight and built to stand up under hard usage in industry.

No more steel reflectors may be manufactured except for dust-tight and vapor-proof units. Realizing the need to conserve metal, lighting engineers have been working for almost a year to find alternate reflector materials. They have succeeded. General Electric is proud to have been able to contribute to the research that has made these efficient new reflectors possible.

There have been, of course, many experiments with non-metallic reflectors. To make certain that the reflectors on the fixtures you get will give uniformly satisfactory service . . . that they will be strong and durable . . . you will find it advisable to buy tested and certified fixtures. Look for the Fleur-O-Lier or RLM label!

**G-E MAZDA LAMPS  
GENERAL  ELECTRIC**

# FLUORESCENT LIGHTING . . .

**R**ESTRICTIONS which WPB has established on the use of metals in fluorescent fixtures have been a challenge to the lighting industry. A challenge which the industry was more than ready to meet, but which presented almost insurmountable difficulties—coming as it did along with an acute shortage of lighting equipment for important war plants.

Long before the first WPB order, General Electric engineers had been working with fixture manufacturers to develop new fixtures using a minimum of critical materials. Last January, G-E announced that

several types of non-metallic reflectors had been developed. Today, thanks to the ingenuity of the fixture manufacturers, a large selection of certified fluorescent fixtures, complying with WPB requirements and meeting the lighting industry's rigid specifications, are now available on priorities for war plants that need them.

General Electric is proud of its share in this achievement—and G-E research will continue to work with fixture manufacturers toward making better and better lighting fixtures—for the duration and afterwards.

## Now... CERTIFIED FIXTURES ARE AVAILABLE FROM MANY MANUFACTURERS

**LIGHT—STURDY CONSTRUCTION... FOR CONTINUOUS ROW OR INDIVIDUAL MOUNTING... 2 OR 3-LAMP TYPES IN 40-WATT SIZE—2-LAMP 100-WATT SIZE**

Here are a few of the many different types of certified fluorescent fixtures available from the 50 Fleur-O-Lier and RLM Manufacturers through their whole-

salers. All comply with WPB conservation orders and are made by manufacturers of ETL certified equipment. (*Names of these manufacturers on request.*)

*General Electric does not make lighting fixtures but is glad to recommend certified fluorescent fixtures.*



\*In process of certification when this advertisement goes to press.

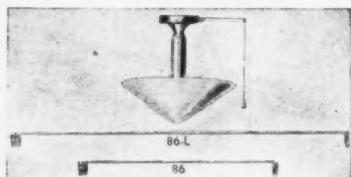
**G-E MAZDA LAMPS**  
**GENERAL  ELECTRIC**





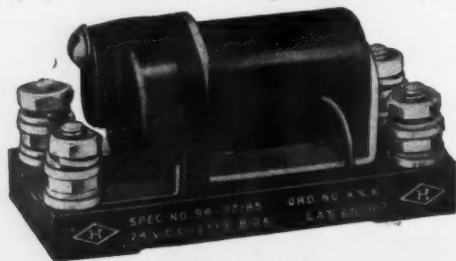
A new cable connector, known as "Quik-Trik", that locks tight, quickly unlocks and is fully insulated has been developed for arc welding. Female section is soldered to cable lead. Male section is soldered to cable extension. Removable insulators are held in position with Allen screws. Connection is made by inserting male section into female section. The female section, when installed on a cable lead, may also be used as a holder handle and connected directly to the "Stinger" end of a holder. Jackson Products, 3265 Wight St., Detroit 7, Mich.

A new Levolver extension arm has been developed to eliminate the constant rubbing of lamp cords against reflectors, shades and bowls. This unit is designed to fit over the Levolver switch lever. The Nos. 86 and 86-L arms are made to fit on the new steel lever 41-B, 1010 and 1039 plastic shell switches. The pull cord is threaded through the end hole or the loop of the extension arm and attached to the chain on the lever. This allows for pulling lights on and off without interference from the shade or basin fixture. McGill Manufacturing Co., Inc., Valparaiso, Ind.



McGILL  
EXTENSION  
ARM

The 25 ampere "Diamond H" aircraft relay is for use in the remote control of fuel pumps, landing lights, gun firing control and other aircraft assemblies. It is the single pole, double break type and is designed for continuous duty service on either 12 volt or 24 volt d.c. circuits. Vibrations of 5 to 55 cycles per second may reach an amplitude of  $\frac{1}{8}$  inch in any direction without causing failure. Momentary overloads of 150 amperes can be broken without injury to contacts. Hart Mfg. Co., Hartford, Conn.



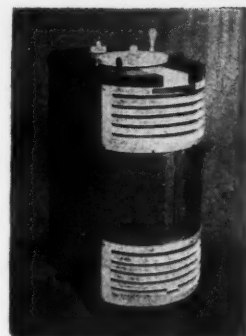
## HART AIRCRAFT RELAY

The new model 240B Streamliner ballast balances the light output and power consumption of two fluorescent lamps, 90° out of phase. It is light in weight and permits easy installation in the ballast channel of the fixture. This ballast has an inductance of advanced design, therefore lamps are correctly balanced. It reduces the stroboscopic effect, eliminating eye strain. Superior Electrical Industries, 2614 West North Avenue, Chicago, Ill.

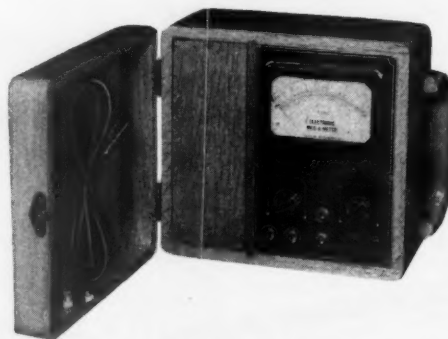


**SUPERIOR ELECTRICAL BALLAST**

A new 500-ampere outdoor a.c. welder has been announced. It has a welding current range from 100 to 625 ampere at 40 volts and is designed for use in shipyards, and other outdoor locations. It has an "idlematic" control which automatically reduces the output voltage to less than 35 volts whenever the arc is not in operation, but provides full power for welding the instant the arc is struck. Welder is protected from snow and sleet by dripproofing in the top of the case and a rain indicator. Other features are automatic finger-tip adjustment, forced ventilation and capacitor cooling. General Electric Co.



### G-E WELDER

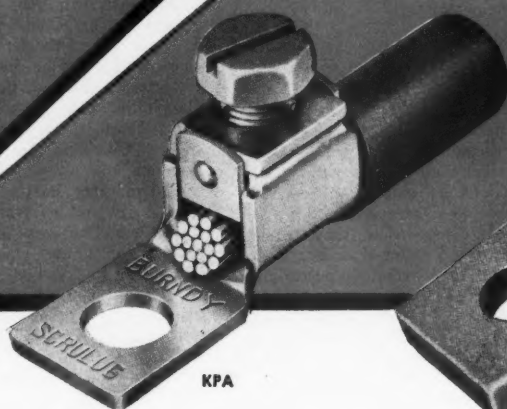


## SUPERIOR INSULATION TESTER

This new battery-operated insulation tester, Model 610-B, is called the Meg-O-Meter. It measures the exact leakage of all insulation from zero up to 200 megohms at a test potential of 500 volts d.c., supplied by a built-in battery and vibrator power supply. It is for either bench or field work. The 500 volt potential is made available by throwing a front panel toggle switch. All calibrations are printed in large type. Panel is of bakelite and instrument is housed in a heavy-duty oak portable cabinet. Superior Instruments Co., 227 Fulton Street, New York 7, N. Y.

**CUT CORNERS**

**and CUT COSTS**

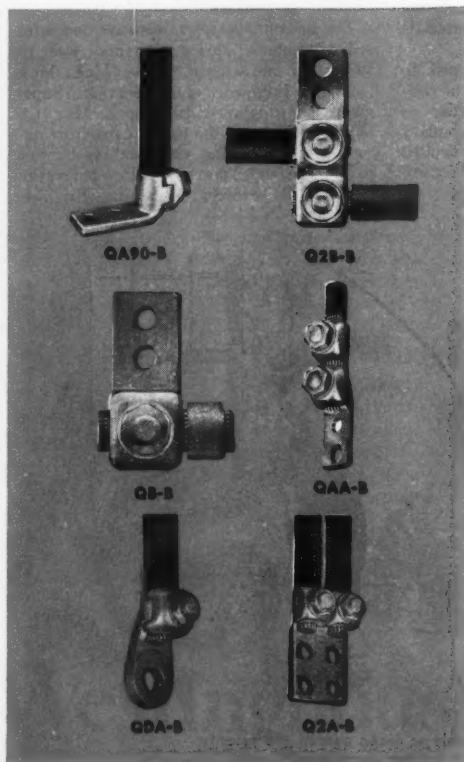


KPA



QA-B

## Burndy SCRULUGS and QIKLUGS



Both these favorites are *unit assemblies*. Thus cables can be inserted easier and quicker . . . and there are no extra parts to loosen or lose. This feature assures a *stronger, more efficient connection*, too. Both are furnished with tongues blank, or drilled as required.

The Scrulug provides extreme compactness, with high mechanical strength. Only 4 sizes are required to accommodate cables ranging from #4 to #200 . . . or from #14 to 4/0 strand.

The Qiklug also provides extreme compactness, and is equipped with an oversize stud to eliminate all danger of stripping or distortion when tightening. And only 11 sizes of the standard Qiklug are necessary for cables ranging from #3 to 2000 mcm. Also supplied in variations to meet all connector needs.

Catalog giving complete information on these and other time-saving, cost-cutting Burndy connectors gladly sent on request.

*Headquarters for connectors*  
**Burndy**

**BURNDY ENGINEERING CO., INC.**  
107 Eastern Boulevard • New York 54, N. Y.

# In the News

## CMP NO. 6 REGULATES CONSTRUCTION

Issuance of CMP Regulation No. 6 brings materials for construction and facilities under the Controlled Materials Plan.

Persons engaged in essential construction have one definite method of obtaining controlled materials and other materials and products to assure completion of their projects according to schedules established by Claimant Agencies.

CMP Regulation No. 6 does not eliminate the necessity for obtaining authorization to construct under the terms of Order L-41. Persons engaged in construction must apply to WPB for allotments of controlled materials as well as for authorization to begin construction.

For the purposes of the regulation, construction includes reconstruction, restoration, or remodeling of any structure or project or any extension or alterations of such project. Facilities are machinery or equipment acquired in connection with construction.

The basic allotment procedure for construction is similar to the procedure in the case of production materials. The controlled materials for which purchase authority will be granted are steel, copper, and aluminum in specified forms and shapes.

Allotments for construction made under CMP Regulation No. 6 will, as in the case of allotments for production, be identified by allotment numbers. Allotments from Claimant Agencies to prime consumers will be identified by a number consisting of a Claimant Agency symbol and a digit or digits, identifying the program, and in some cases, the schedule and project involved.

Allotments to secondary consumers will be identified, as in the case of production materials, by an abbreviated allotment number, consisting of a Claimant Agency letter symbol followed by the first digit only of the program number.

Exemption from the usual allotment procedure is granted in the case of a delivery order for Class A products on contracts or subcontracts which require less than 1 ton of carbon steel or wrought iron, 400 pounds of alloy steel, 100 pounds of copper and copper base alloy, or 20 pounds of aluminum. In these cases an order may be placed bearing the applicable allotment number followed by the symbol SO. Persons receiving orders bearing the SO symbol may use it to obtain their own controlled materials requirements.

Claimant Agencies and Industry Divisions are permitted to authorize controlled materials consumers to obtain their requirements for construction through use of the SO symbol, rather than actually making an allotment of controlled materials.

Persons who have received allotments for authorized construction may place authorized controlled material orders with (1) a warehouse or distributor (according to the terms of CMP Regulation No. 4), or (2) with any controlled materials producer, unless otherwise specifically directed.

As in the case of production materials, consumers are prohibited from ordering more controlled materials for construction or from ordering them at an earlier date than needed to complete the construction. The Regulation also stipulates that in placing orders for controlled materials the terms of CMP Regulation No. 2, governing the amounts of inventories which may be carried, must be observed. However, a consumer is not required by this provision to reduce an order for controlled materials below minimum mill runs.

Preference ratings will be assigned to construction, at the time allotments of controlled materials are made, in order to permit prime consumers and secondary consumers to obtain other than controlled materials and products essential to the completion of the construction.

The regulation makes clear that persons engaged in construction are not relieved of the obligation of complying with applicable regulations of WPB or with orders in the E, L, M, P, T, and U series.

## KENTUCKY IAEI CONVENES

Electrical inspectors from the Blue Grass State converged on Cincinnati, Ohio for their semi-annual meeting June 17 and 18. At their invitation, members of the Ohio and Indiana Chapters, Western Section, IAEI, joined them to participate in a discussion of wartime inspector problems and electrical safety in general.

The initial talk of the program was that of Frank E. Sanford, Distribution Engineer, Cincinnati Gas & Electric Co. In viewing the postwar prospects of the electrical industry, he traced the numerous industrial revolutions which paralleled or followed wars that now are history. Particular emphasis was placed on electrical developments and if history repeats itself, as it usually does, he concluded that the era following World War II will bring many advances based on present industrial developments and material research.

Joseph J. Siddall, Electrical Engineer, H. H. Robertson Co., Pittsburgh, Pa., suggested that the IAEI back standardization of building codes with the resultant closer cooperation between electrical inspection departments and the building inspection bureaus. Caution must be exercised to prevent the "pressuring" of wartime sub-standard rules permanently in the N.E.C., he warned.

The use of capacitors, busways and infrared equipment during wartime was the subject of one session. Chas. McL. Moss, District Engineer and Service Supervisor, Westinghouse Electric & Mfg. Co., Cincinnati, traced the use of capacitors as a means of increasing electrical system capacity through power factor correction. Sheldon B. Storer, Managing Engineer,



It's a walkie-talkie so I can consult the priority board direct on rulings.





at this point—arcs go *Out!*

#### LIKE THIS



Diamond-pointed break jaws confine arcing to the point...force the arc to break outside the current-carrying areas. Contact surfaces stay clean, don't pit and burn.

#### NOT LIKE THIS



When ordinary safety switches are opened the arc leaps across the contact areas...along the jaw and blade. It hangs on longer, burns and pits the contact surfaces.



When a switch is opened under load, hot arcs leap between the opening contacts. Burning with terrific heat, they bead and pit the contact areas—unless they are controlled and extinguished *quick*.

Westinghouse Safety Switches do both these jobs. With break jaws pointed like a diamond and the blade extended, leaping arcs are forced to break *outside* the current-carrying area. Contacts stay clean, last longer.

Installed in your plant, Westinghouse Safety Switches will reduce time-outs for maintenance and inspection, provide better, more dependable protection. For circuits of 575 or 600 volts, you get another protective plus—the "De-ion" arc quencher. This exclusive feature divides arcs, extinguishes them quickly.

Provide your important circuits with the protection they need—install Westinghouse Safety Switches. Available in ratings up to 1200 amps, 600 volts. Call your nearest Westinghouse office or write Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-21275

PLANTS IN 25 CITIES...



OFFICES EVERYWHERE

# Westinghouse SAFETY SWITCHES

## To find the *Unusual*...

These are days of change . . . new products, new materials, substitutes, synthetics, new ways of doing things. Ten to one if you're seeking the *unusual* in the electrical field, your copy of the new 1943 E-B-R (Electrical Buyers Reference) can help you handily—with its 592 pages of compact data on thousands of products, beautifully indexed and cross-indexed for rapid reference . . . including 369 pages of useful BRIEFALOGS\*.



## To find the *Usual*...



Most of your time today is still spent sleuthing for the hundreds and hundreds of *regular* electrical items you use and need, for new manufacturers, old manufacturers adding to their lines, others dropping certain items. This is bread and butter stuff for E-B-R—and you'll find your copy complete, (especially those helpful BRIEFALOGS\*) comprehensive, with "fingertip control" for finding out what you want to know—fast.

\* E-B-R's own original version of modern condensed cataloging.

## IF IT'S ELECTRICAL ...LOOK IT UP FIRST IN **E-B-R**

Now more complete than ever before, your 1943 Electrical Buyers Reference gives you:

**MANUFACTURERS BRIEFALOG SECTION**—Condensed catalogs of 290 manufacturers. Product specifications, branch offices, warehouses, etc.

**CLASSIFIED DIRECTORY**—Company addresses and trade names, arranged by product. Extensive cross-references to help you find the electrical and allied products made by more than 3,500 manufacturers.

**INDEX OF TRADE & COMPANY NAMES**—Complete with addresses. Starting with only a trade name or a company name, you can thus quickly locate the product data you need.

A WORD OF EXPLANATION—E-B-R is not sold, and is not offered as a premium for subscriptions to any magazine. It is distributed to a limited number of men directly responsible for the specifying or requisitioning of substantial amounts of electrical materials.



McGraw-Hill Publishing Company, 330 W. 42nd St., New York, N. Y.

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## COUNTY WIRE A

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Electric

The Trumbull Electric Mfg. Co., Norwood, Ohio, told the assembled group what busway designs were available and what can and cannot be done with them under wartime restrictions. In clarifying Limitation Order L-273 on busways, he noted that trolley duct was not included under the order and that everything covered therein required a priority rating of AA-5 or better. In a discussion on recent developments in infra-red oven equipment, Paul H. Goodell, Electrical Engineer, The Trumbull Electric Mfg. Co., related the trend to enclosed ovens, particularly in high temperature applications, primarily to retain and maintain convection heat in addition to radiated heat. Although some 1000-watt heat lamps are now in use, postwar planning is along the level of 500-watt lamps, he reported.

Reporting for the New Materials and Methods Committee, Walter D. Roach, Louisville, Ky., recommended that solderless lugs be made mandatory by the electrical committee; the elimination of wall switches in house wiring during the war to conserve copper; and the adoption of the bare neutral system of wiring.

Contractor and inspector members took the stage to relate unusual and interesting problems encountered in the field, after Victor H. Tousley, reviewed the interim amendments to the N.E.C. Led by Vic, the boys really took down their hair in a good natured banter of experiences.

Officers of the Kentucky Chapter, IAEI are: chairman, R. H. Scherzer, Louisville; vice-chairman, R. J. Seiler, Cincinnati; secy-treas., V. F. Knadler, Louisville.

## COUNTY BOARDS ISSUE FARM WIRE ALLOTMENTS

County war boards of the U. S. Department of Agriculture will distribute farmstead wiring to farmers under the program established by the War Food Administration to replace order P-144.

State and county quotas of wire have been established, to be filled from Agriculture Department's quarterly allotment of copper under the Controlled Materials Plan. Farmers who are eligible for extension of service under order U-1-c or who presently have service will apply to their county war boards for the wire they need. If their applications meet WFA standards, they will be granted Copper Wire Allotment Certificates which must be presented to suppliers within 10 days. Suppliers will replenish their stocks by extending the certificates.

WFA standards for the allotment of farmstead wiring require that it be used to produce additional food or to save farm labor. The number of livestock or poultry on any farm will determine the amount of wire its

owner may obtain. Maximum wire for any presently unserved farm is 75 pounds, and for farms now receiving service, 50 pounds. None of the wire may be used to extend service to dwellings.

This procedure is separate from that under which farmers can get up to 75 feet of wire by certifying that it is needed for farm operations.

## PATRICK A. DWYER

Patrick A. Dwyer, president of Dwyer Electric Company of Rochester, N. Y., died June 12. Born in Roma, Ontario, Mr. Dwyer came to Rochester about 1891. In the years prior to the last war he was electrical construction superintendent for the Wheeler Green Electric Co. In 1923



PATRICK A. DWYER

he formed the Dwyer Electric Company, Inc., which during the ensuing twenty years grew to a strong position of prominence among Upstate New York electrical contractors.

Mr. Dwyer was an active leader in business and social affairs and a member of the Rochester Chamber of Commerce and the Rochester Society of Electrical Contractors.

## CONTRACT TERMINATION PLAN PROMISED

The Senate's Small Business Committee will get legislation to provide prompt and liberal payment in advance of final settlement of terminated war contracts when Congress returns to the capitol next fall.

Chairman James E. Murray, Montana Democrat, promised to present the legislation, declaring the subject to be "one of the prime tasks before the present session of Congress". Legislation offered thus far, he asserted, fails to provide a satisfactory approach to the problem in that it merely authorizes procurement agencies to make such settlements and does not require them to do so. Nor does it authorize payments directly to subcontractors, Murray complained. Widespread insolvency, unemployment and handicaps to reconversion are the results of failure to make prompt settlement and advance payments on contracts which

have been terminated, Mr. Murray said.

Murray's six-point plan would:

1. Make payments to contractors and subcontractors mandatory in advance of settlement.
2. Allow advance payments of at least 75 percent of the amount certified by the contractor or subcontractors.
3. Require advance payments within 30 days after certification.
4. Allow procurement agencies to make or guarantee loans against terminated contracts through private banks.
5. Allow the contractor or subcontractors to sue the government if he does not receive at least the minimum amount within the stipulated period.
6. Require establishment of uniform contract termination policies by the chairman of WPB.

## CONDUIT INSTALLATIONS RESTRICTED FURTHER

Additional restrictions on the manufacture and installation of rigid electrical conduit, electrical metallic tubing, flexible metal conduit or tubing, and raceways are imposed by an amendment to Limitation Order L-225.

Manufacture of electrical metallic tubing (commonly known as thin wall conduit) is limited to 75 percent of 1941 production and manufacture of flexible metal conduit or tubing is limited to 50 percent of 1941 production by the provisions of the amended order.

The amended order also makes the following changes:

1. No person shall install rigid electrical conduit in a size greater than the minimum size permitted for such installation by the 1940 edition of the National Electrical Code.

2. No person shall install rigid electrical conduit sizes  $\frac{1}{2}$  in. to 2 in. inclusive, except:

(a) When the installation is in a Class I, II, III or IV hazardous location and the 1940 edition of the National Electrical Code establishes the use of such rigid electrical conduit as a minimum acceptable standard of wiring; or

(b) To suspend an industrial lighting fixture weighing 4 pounds or more.

3. No person shall install rigid electrical conduit sizes  $2\frac{1}{2}$  in. to 6 in. inclusive, except when

(a) The installation is such that the electric wires or cables require for safety purposes protection from mechanical injury; or

(b) The installation is made in wet locations, as defined in Article 100 of the 1940 edition of the National Electrical Code; or

(c) The installation is made in a Class I, II, III or IV hazardous location and the 1940 edition of the National Electrical Code establishes the use of such rigid electrical conduit as a minimum acceptable standard of wiring; or

(d) Electric wires or cables are required because of the construction of a building or structure, to be enclosed within concrete or masonry.



## Who Wants SAUERKRAUT for Breakfast?



● The answer is easy—practically nobody. Nor do most folks like to eat breakfast with the stale odor of last night's meal still hanging like a blanket around their nostrils.

Kitchen exhaust fans aren't exactly new. Victor was the outstanding manufacturer of domestic ventilators for many years before the war. But ventilation in the home of tomorrow won't be confined to the kitchen. Fresh, clean air will circulate through the entire house at the touch of a button.

For the amusing but accurate picture of post-war ventilation, write for your free copy of the booklet, "You'll Do It 26 Thousand Times Today." Address Dept. 1B-636.



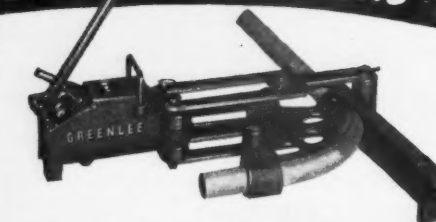
Victor . . . solving tomorrow's  
ventilation problems today

**VICTOR ELECTRIC PRODUCTS, Inc.**  
2950 Robertson Road Cincinnati, Ohio

## EXTRA MANPOWER with GREENLEE BENDERS



Shown above is the Greenlee No. 770 Bender with radius shoe attachment. With one forward stroke of the ram, a smooth, neat-looking, 90° bend is made in a jiffy.



● It's easier to get along short-handed these days if you have tools to eliminate long, tedious hours of hard work. And there's less absenteeism, too, when you have tools that lessen the physical strain on your men. Good tools provide extra manpower—help get more work done—speed up jobs. When you need better tools for essential jobs, investigate the current line of Greenlee Tools. You'll find Greenlee Benders, for instance, will provide extra manpower for all bending jobs, large or small. They are powerful, portable, easy for one man to operate.

### There's A Greenlee Bender For Every Job!

Whatever you have to bend—tubing, E.M.T., heavy-wall conduit, or bus bar—there's a Greenlee Bender, including powerful hydraulic units, that will help ease your manpower problems.



**Greenlee  
TOOL CO.**  
1748 Columbia Ave. • Rockford, Illinois



[FROM PAGE 103]

4. No person shall install electrical metallic tubing in a size greater than the minimum size permitted for such installation by the 1940 edition of the National Electrical Code.

5. No person shall install any electrical metallic tubing, except:

(a) To enclose electric wire or cable which requires, for safety purposes, protection from mechanical injury; or

(b) To enclose electric wire or cable required, because of the construction of a building or structure, to be enclosed within concrete or masonry; or

(c) To enclose electric wire or cable located in elevator hoistways and used for elevator power, control and signal purposes; or

(d) To enclose electric wire or cable located in wet locations as defined in Article 100 of the 1940 edition of the National Electrical Code; or

(e) To suspend an industrial lighting fixture weighing four or more pounds.

6. No person shall install flexible metal conduit or flexible metal tubing in a size greater than the minimum size permitted for such installation by the 1940 edition of the National Electrical Code.

7. No person shall install any flexible metal conduit or flexible metal tubing, except to provide a flexible enclosure for:

(a) Electric wire or cable which is a component part of a machine; or

(b) Electric wire or cable extending less than twelve (12) feet from rigid electrical conduit, electrical metallic tubing or raceways to electric motors, current consuming devices or electric control equipment.

8. No person shall install raceways in a size greater than the minimum size permitted for such installation by the 1940 edition of the National Electrical Code.

9. No person shall install any raceway except to enclose electric wire or cable:

(a) Which requires for safety purposes protection from mechanical injury; or

(b) Which is required, because of the construction of a building or structure, to be enclosed within concrete or masonry.

*Restrictions on sale by a manufacturer or distributor.* No manufacturer or distributor shall sell or deliver any rigid electrical conduit, electrical metallic tubing, flexible metallic tubing, flexible metallic conduit or raceways, except that:

(a) A distributor or manufacturer may sell or deliver such conduit, tubing or raceways pursuant to an order or contract bearing a preference rating of A-1-j or better; or

(b) A manufacturer may sell or deliver such conduit, tubing or raceways to another manufacturer; or

(c) A distributor may sell or deliver such conduit, tubing or raceways to another distributor.

*Specific exemptions.* The installation of any rigid electrical conduit or any electrical metallic tubing or any flexible metal

conduit or flexible metal tubing or any raceway shall not be prohibited in any way by the provisions of this order provided such tubing, conduit or raceway:

1. Has been used, or
2. Is or will be incorporated into
  - (a) Aircraft, armament, radio, radar, ships, tanks, vehicles, weapons, protective alarm systems or locomotives; or
  - (b) Any equipment designed and constructed to be used in combat; or
3. On or before December 16, 1942
  - (a) Was in the possession of an electrician; or
  - (b) Had been delivered or was in transit to the site of installation; or
4. Is to enclose electrical conductors located adjacent to telephone equipment or other apparatus when the metallic shielding of such electrical conductors is required to insure the proper operation of the telephone equipment or other apparatus.

*Extension of ratings for certain conduit and tubing.* Notwithstanding the provisions of any priority regulation, any person having a rated order for rigid electrical conduit may extend such rating for an equal amount in linear feet of electrical metallic tubing of the same size, and any distributor having a rated order for electrical metallic tubing may extend such rating for an equal amount in linear feet of rigid electrical conduit of the same size.

#### WIRING AND LIGHTING DESIGN GUIDE

Engineers, architects, contractors and building consultants are advised by the Conservation Division of the War Production Board to check all lighting specifications for construction or conversion projects which are now being drawn up, to make sure that they comply with the policy outlined in the "Design Guide for Interior Electric Lighting and Wiring for Wartime Construction." Construction and wiring of plant should conform to the recommendations of the Guide, Government officials stated, since these recommendations are used as the official WPB criteria in analyzing and approving applications for priority assistance to obtain fixtures and other materials required in lighting installations.

Use of critical materials in lighting installations has for some time been controlled by WPB limitation orders. Limitation Order L-78 controls the production of fluorescent lighting fixtures, in some cases calling for non-critical substitutes for the critical materials formerly used, and in others reducing the amount which may be used in production. An over-all saving of 70 percent of the steel content in fluorescent lighting fixtures resulted from these restrictions.

Incandescent, fluorescent and other electrical discharge lamps were standardized under the terms of Limitation Orders L-28 and L-28-a.

The Guide, which covers the end use of various types of lighting installations, is a major step in the over-all conservation program to conserve critical materials in elec-

# "WAR-AID"

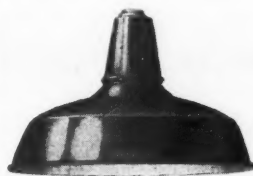
## Fluorescent Fixtures by Wheeler...



Sturdy metal-conserving wiring channel. Non-metallic reflector with chip-proof washable surfaces. Made for 2 or 3 40-watt lamps, or 2 100-watt lamps. Easily adapted for continuous runs.

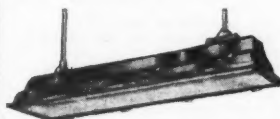
- maintain "skilled lighting" standards
- conserve critical materials

#### OTHER WHEELER FIXTURES



**RLM One-Piece Solid Neck  
Reflectors**

Made in Dome, Angle and all other standard types. For indoor or outdoor use.



**Class II-G Dust-Tight Units**

Fluorescent fixtures approved for "Class II-G" hazardous locations. Hinged cover protects lamps, sockets and reflecting surfaces. Made for two or three 40-watt lamps.

IT takes accurate "seeing" by workers to maintain today's precision standards of production. In any warplant, that means lighting of the most modern, efficient type.

To make such lighting available in spite of wartime metal shortages, Wheeler Reflector Company developed "War-Aid" RLM Fluorescent Fixtures. Made with minimum strategic materials... designed with "know how" gained in over 60 years of specialized experience... "War-Aid" Fixtures offer the same high-efficiency illumination that has always typified Wheeler "Skilled Lighting."

Whether you require fluorescent or incandescent illumination, Wheeler can supply *skilled lighting* for precision production. Write for catalogs of both types. **Wheeler Reflector Co., 275 Congress St., Boston, Mass. . . . New York, Cleveland.** Representatives in principal cities.

*Distributed Exclusively Through Electrical Wholesalers*

**Wheeler** REFLECTOR  
COMPANY  
Lighting Equipment Specialists Since 1881

## SIMPLEX WIRES AND CABLES

# After the War

YOU may have wondered how insulated wires and cables that you will buy after the war will differ from those that have served you so well. No one knows all the answers but we can make some predictions about Simplex wires and cables, based on past experience and present developments.

SINCE 1885 Simplex has devoted all its energies to providing insulated wires and cables needed by the rapidly expanding electrical industry. Our aim has been not only to meet requirements by keeping abreast of industry development but, if possible, to anticipate its needs. Simplex in this has earned a reputation as a pioneer in cable engineering.

The adjustments made necessary by military needs and the unusual demands of war-time industry always have stimulated research and led to better products for commercial use later. The present emergency is no

exception. Cable developments now taking place cannot be discussed but definite and important changes are being made which can be adapted to commercial uses when victory has been achieved.

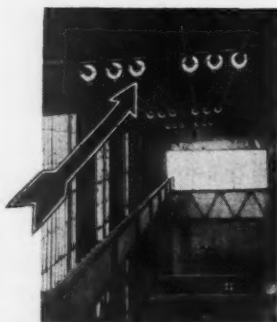
Simplex research and pioneering of the past now enables us to play an important part in many of the present day developments. When the war is over, Simplex will provide for commercial use the improved wires and cables developed during this war. Simplex trade names that have meant quality and service in the past will mean the same again but in greater degree.

## Simplex WIRES and CABLES

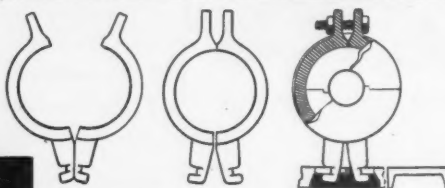
Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

### "EFFICIENCY" DEVICES FOR CONDUIT AND CABLE SUSPENSION

#### THE EFFICIENCY CABLE RACK



Cable Racks available for cable diameters from 5/16 to 2 1/2"



... a definite step forward in cable suspension! Note, in the illustration, the simplicity and convenience of this new type support. Tightening a single bolt spreads the flanged foot portions to engage the sides of the hole in the rack. This same operation clamps the bushing securely and permanently in place ... makes a positive fastening which cannot be loosened by vibration or shock. Each fitting is a separate unit ... permits the installation of each line or cable independently. Each customer's rack is made up with mountings to carry your designated number of cables. For A. C. service a brass half is used.

This design offers minimum resistance. Make this new bushing support and rack your choice for simplicity of installation and ease in stringing cable.

Complete information on all EFFICIENCY Electrical Devices is available. Write today for your copy of Catalog No. 38A.

## Efficiency

ELECTRIC AND MANUFACTURING CO.



MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION

## In the News

[FROM PAGE 105]

tric lighting installations without the sacrifice of effective seeing conditions.

In all instances before completing designs for lighting installations the Guide should be consulted. Deviations from the policy outlined in the Guide may cause delay or possible denial of priority assistance when applications are reviewed by WPB analysts.

Copies of the Guide may be obtained upon request from the WPB Conservation Division, 11th and H Streets, N.W., Washington, D. C.

### KENNE HEADS MINNESOTA COUNCIL

Donald F. Kehne, president of the St. Paul Electrical Contractors Association, was chosen president of the Minnesota Electrical Council, Inc. Other members voted into office include: vice-president, Ed. M. Raetz, Rochester; treasurer, F. M. Tripp, Minneapolis; and secretary-manager, Wm. A. Ritt, St. Peter, Minn.

Directors at Large are: E. M. Raetz, Rochester, J. W. Hruska; Ed Karst, Fergus Falls; and Lou Gordon, Albert Lea. F. M. Tripp and Wm. A. Ritt continue to represent the contractors on the Board of Directors of the North Central Electrical Industries.

### CINCINNATI HOLDS SAFETY ENGINEERING COURSES

Under the sponsorship of the local War Production Board, a third group of safety engineering classes are being held at the University of Cincinnati and Central High School in Hamilton, Ohio. The main objective of the course, open free of tuition to those employed as safety engineers or in supervisory capacities in industry, is to reduce to an absolute minimum the man hours lost through industrial accidents.

Two night sessions per week are being held from July 6 to Sept. 24 and cover a comprehensive list of topics on plant safety in general. Four instructors, chosen from various industries in the Cincinnati area, handle the course. They are: J. J. Prabhulos, coordinator, Safety Engineer, National Distillers Products Corp., Cincinnati; Clifford Doer, Safety Engineer, Procter & Gamble, Cincinnati; Charles Barth, Safety Engineer with Division of Safety and Hygiene, Division of Ohio Industrial Bureau; and Ray E. Stroppel, Maintenance Engineer, Tool Steel Gear and Pinion Co., Cincinnati.

Significant is the fact that a maintenance engineer is playing a prominent part in the instruction work, and that the value of maintenance as a safety as well as a production feature is acknowledged. Subjects covered in Mr. Stroppel's classes in-



clude: layout and arrangement; attention to safety in purchasing; hand tools; low voltage electrical hazards; plant house-keeping; maintenance; illumination; safety inspections; fire prevention, protection and fundamentals.

These courses are a part of the vast educational program underwritten by the United States Office of Education through its Engineering, Science and Management War Training Program.

## GENERATORS

Purchasers of machinery into which is incorporated a special electric motor or generator need no longer file a certification setting forth the use and purpose of the motor or generator. This change in procedure is made in General Conservation Order L-221, as amended by WPB.

## PRICE ADJUSTMENT ALLOWED

An amendment to MPR-251 has made provisions for the individual adjustment of maximum prices for contractors supplying construction services or who install building and industrial equipment in local shortage situations.

The action provides for more expedient treatment of adjustment petitions by authorizing regional OPA administrators to deal with situations in which acute local shortages exist or threaten to exist. Local orders or regulations applying to a group or class of sellers may be issued by the regional officials.

Before adjustments can be granted it must be ascertained that the service or material is vital in the war effort or is essential to the standard of living consistent with the prosecution of the war and that the proposed adjusted prices will eliminate or reduce the shortage, provided that the adjustment will not tend to create shortages or need for increased prices in other localities.

The action, similar to provisions in other price regulations, was contained in Amendment No. 2 to Maximum Price Regulation 251 (Construction and Maintenance Services and Sales of Building and Industrial Equipment and Materials on an Installed or Erected Basis) and is now in effect.

OPA also announced that conferences are being held with various contracting groups for the purpose of preparing regulatory action which would be substituted for Regulation 251 in its control over building repair and maintenance.

## ELECTRONICS SUBJECT DRAWS CROWDS

That electronics is a hot subject now and will be more so in the postwar era, was evidenced by the fact that more than 300 industrial representatives in Indianapolis, Ind., enrolled in an electronics course sponsored by the Electric League of Indianapolis, Inc.

# Latrobe PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES ★

HIGH  
QUALITY

EASILY  
INSTALLED

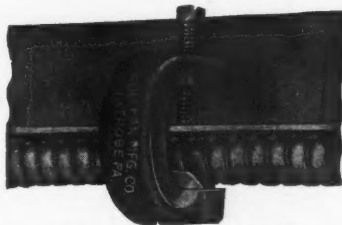
## YOU CAN FEEL SAFE WITH THE LATROBE LINE

Latrobe products are practical, wholly free from defects and may be installed quickly without a lot of unnecessary work. Suitable for all types of war emergency and civilian jobs.



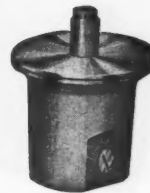
NO. 330 OUTLET

This Tom Thumb Utility outlet is convenient for use in wood floors, baseboards, show windows, etc. — Easily installed — Economical.



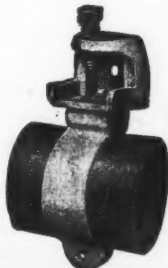
"BULL DOG" ARMORED CABLE SUPPORT

A light, strong clamp that can't be shaken loose. Right for supporting or hanging armored cable to steel framework. Will not crush or deface surface.



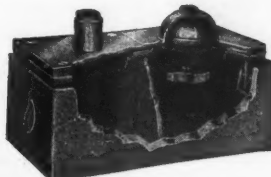
NO. 100 BOX

Shown here with No. 208 Nozzle. Fewest number of parts. Least labor to install. No fussy small screws.



NO. 403 INSULATION SUPPORT

With No. 466 Pipe Hanger attached to 2½" conduit.



NO. 252-R FLOOR BOX

This adjustable 2 gang box is shown with No. 208 Receptacle in one section. One cover plate with ½" and one with 2" flush brass plugs.



"BULL DOG" BX CABLE STAPLES

Excellent quality staples packed in cartons, kegs, and barrels. Kegs contain 6,000; barrels 30,000.

## SELL LATROBE PRODUCTS FOR BEST RESULTS

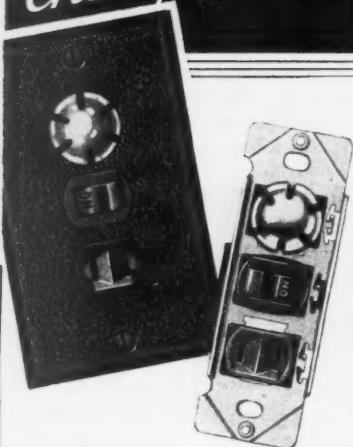
DURABLE



ECONOMICAL

**FULLMAN MANUFACTURING CO.**  
LATROBE . . . PENNSYLVANIA

# P&S DESPARD Inter-changeability



The interchangeable features of the P&S-Despard Line mean more than ever in these days of limited stocks.

Just the thing for that next job — T-rated switches, double-grip outlets, pilots and accessories.

Keep your P&S catalog handy — Send for a new one if yours is out of date.

SOLD THROUGH  
ELECTRICAL WHOLESALERS

**PASS & SEYMOUR, Inc.**  
SYRACUSE, N.Y.

*In the News*

[FROM PAGE 107]

The course, the final session of which was held on June 28, was conducted by Karl H. Keller, District Control Specialist, General Electric Company, Cleveland, Ohio. The clarity and interesting method of his presentation brought its just reward in an audience of several hundred men who turned out on hot, humid nights to wrestle with a two-hour technical discussion of the subject—even giving up the intermission periods to glean the last bits of information possible.

These sessions are just one indication of the progressive steps taken by the League to keep its members and the industry informed on latest technical developments in the electrical field. Postwar planning is another topic of deep concern with this organization. Along these lines the League has sponsored successful All-Industry meetings and has joined forces with the construction industry to form what is known as the Indiana Construction Industry Policy Committee which will concern itself primarily with postwar planning.

In this matter the League is not confining its efforts to local thinking alone but is considering the national viewpoint. Walter O. Zervas, managing director of the League, recently attended the National Conference on Planning at Omaha, as a representative of the State of Indiana. With background material gathered in this manner, the organization looks forward to the formulation of a sound program for its members.

## MINNESOTA LAW CONTROLS WHOLESALE BUYING PRACTICES

You can't "get it wholesale" any more in the state of Minnesota. Unethical wholesale buying practices were curbed by the 1943 Minnesota Legislature when it recently passed the Minnesota Trade Diversion Law, Chapter 144, Minnesota Laws of 1943. By taking this progressive step to protect consumers against fraudulent practices and to foster the welfare of thousands of retailers in the state, Minnesota has joined Wisconsin, Michigan, Illinois and Pennsylvania, which have adopted similar legislative codes outlawing fraudulent selling practices.

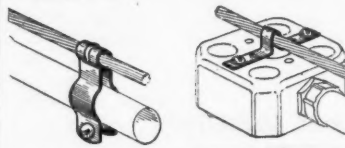
One of the main provisions of the law prohibits an employer from directly or indirectly buying, selling or having in his possession for sale to his employees any merchandise not regularly handled or produced by such employer; also prohibits use of employer's name, credit or premises in connection with purchase or sale of such merchandise. This does not apply to health or safety equipment furnished to employees for use in connection with employment, or to candy, gum, tobacco or meals consumed on premises. Employers are still permitted, without restrictions on



## New Practical Unit to Cut Installation Time

• The "Messenger Hanger" and the "Messenger Strap" fill the need for an economical, practical, time-saving unit for use with the new messenger cable type of installation. Mechanically strong, durable, lightweight. They have considerable material and are easily and quickly installed. Our bulletin gives full and complete details—send for it.

See your Jobber.



"Messenger Hanger" for Conduit and Cable strong, made of Cadmium Plated Steel or Everdur. Top loop of hanger grips messenger cable to permit conduit to be put in place without falling off.

"Messenger Strap" for Outlet Boxes Of Cadmium Plated Steel or Everdur. For messenger cable installation to be used with MINERALLAC "Messenger Hanger." Fits all standard outlet boxes and 3/4" messenger cable.

## MINERALLAC ELECTRIC COMPANY

New York City Office 50 CHURCH ST.  
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25 N. Peoria St. Chicago

## MULTI



RLM INDUSTRIAL REFLECTOR



TWO-PIECE GLASSTEEL DIFFUSER

## REFLECTORS

• Practical, modern units with flexibility to meet today's many changing requirements—that's the MULTI line of industrial and commercial units. Contractors like them because they give them no after worries—customers like them because they give good lighting efficiency. MULTI Units—Incandescent and Fluorescent—are easy to maintain and service—they are "designed for the job."

Send for complete catalog.

**MULTI**  
ELECTRICAL MANUFACTURING CO.  
1840 W. 14th St., CHICAGO, ILL.

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price, to sell their employees any merchandise regularly handled, stocked or produced in the regular course of business.

The law goes further than merely prohibiting the unfair practice of industrial selling to employees. It includes several provisions to protect the public from evil practices that were the result of the "I can get it for you wholesale" attitude of the past. Stated briefly these are as follows:

1. Makes it unlawful for wholesaler or other seller of merchandise to advertise or claim to sell at wholesale unless such sale is for resale or is a sale of substantial quantity for business use only.

2. Prohibits retailer from misrepresenting his business by referring to himself as a manufacturer, wholesaler, or broker when in fact he performs none of those functions. Any firm may be engaged in both wholesale and retail trade if such functions are clearly separated or defined and do not lead to misrepresentation or misunderstanding.

3. Prohibits retailer from advertising, using catalogs or displaying price tags that show prices fictitiously in excess of actual prices at which such merchandise is regularly sold. Also prohibits misrepresentations as to the quality, ingredients or origin of merchandise.

In addition to the penalties provided in the act, the law also provides that any person damaged or who is threatened with loss, damage, or injury by reason of a violation of the act shall be entitled to sue for and have injunctive relief in any court of competent jurisdiction against any damage or threatened loss or injury by reason of a violation of the act and for the amount of the actual damages to him. To obtain such injunctive relief it shall not be necessary to allege or prove that an adequate remedy at law does not exist.

Furthermore, the law provides that if one provision of the act shall be found by the decision of a court of competent jurisdiction to be invalid, such decision shall not affect the validity of the other provisions of the act.

This act does not apply to cooperative associations established under the laws of the State of Minnesota. Any merchandising transactions between such associations and their members authorized by their charters are exempt.

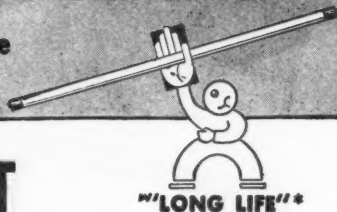


**MINNESOTA INSPECTORS C. W. Turner (left) Faribault, Minn., member of the State Board of Electricity and Glenn Rowell (center) Fire Underwriters Inspection Bureau, Minneapolis, give T. J. Hojem, Westbrook contractor some pointers on rural wiring safety.**

*Electrical Contracting, August 1943*

# At last! REALLY DEPENDABLE, TROUBLE-FREE FLUORESCENT LIGHTING

made possible by the exclusive  
developments of Artkraft



## ARTKRAFT

### HOT CATHODE FLUORESCENT LIGHTING SYSTEMS

1. **NO STARTER SWITCHES**—Artkraft resonant starting eliminates this troublemaker which has always required constant servicing and replacement.
2. **THE ONLY GUARANTEED LAMP**—Guaranteed for 3,000 hours. Rated life 5,000 to 6,000 hours.
3. **CONSTANT VOLTAGE POWER PACK**—Efficient operation at 85 to 135 volts. Good lighting assured where overloaded lines and wide fluctuations of voltage make impossible the use of all other fluorescent systems. Also adaptable to 220 and 440-volt systems, single or three-phase. Cannot short-circuit the line.
4. **CONSTANT-TEMP HOT CATHODE**—Corrugated mesh ribbon filament permits the use of abundantly more emissive compound, and control of secondary voltage and Constant-Temp feature furthermore prevent rapid discharge of this compound.
5. **BLACKENING IN LIGHT COLUMN REDUCED** by exclusive cathode design, assuring a brighter lamp.
6. **100% POWER FACTOR** at rated voltage. 98% or over within 85 to 135-volt range.
7. **"EASY MOUNT" LUMINAIRE** permits instant removal, without tools, for cleaning non-ferrous reflector or lamps.
8. **STROBOSCOPIC (FLICKERING) EFFECT SUBSTANTIALLY REDUCED.**
9. **BALLAST REPLACEMENTS UNKNOWN.**
10. **MORE LIGHT FOR THE SAME CURRENT.**
11. **FIELD TESTED FOR OVER FIVE YEARS.**
12. **MODERATE FIRST COST.**
13. **EXCLUSIVE FEATURES RADICALLY REDUCE MAINTENANCE COSTS** and save many man-hours.



**Write for Folder F-102**

**WHOLESALEERS:** Write for proposition.

**FIXTURE MANUFACTURERS:**

Investigate our licensing proposition at once. Artkraft Systems are now available through the manufacturing and distributing facilities of EDWIN F. GUTH CO. F. W. WAKEFIELD BRASS CO. POSTORIA PRESSED STEEL CORP.



## ARTKRAFT

HOT CATHODE  
FLUORESCENT LIGHTING

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THE ARTKRAFT SIGN COMPANY

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# Send FOR THIS TERMINAL BLOCK BOOK



Burke has stepped up production on its line of molded Bakelite Terminal Blocks. These are available in 10 standardized types to meet any wire connection need in Panel, Switchboard or Apparatus wiring. Write for Price List TB-2. Good delivery on high priority orders.

AC AND DC MOTORS AND GENERATORS  
**BURKE Terminal BLOCKS**  
BURKE ELECTRIC COMPANY • ERIE, PENNSYLVANIA

**The Stone You Can Bend and Twist**



*Flex-Stone*

What a job FLEXSTONE does! Cuts like an abrasive stone—but you can bend, twist it. Won't break! Thin, non-brittle. Sharpest abrasives are pressed into flexible core. Easily fits tight places. Smooths hardest contact points in relays, cutouts — cleans small commutators, switches, etc. Non-conductor — no short circuit. Rimac FLEXSTONE speeds electrical service. Send for free sample!

RINCK-McILWAINE, Inc., 16 Hudson St., New York, N. Y.

## CHANGE OF ADDRESS

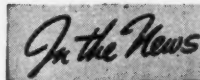
McGRAW-HILL PUBLISHING COMPANY  
330 West 42nd Street, New York, N. Y.

Director of Circulation:  
Please change my address on Electrical Contracting

From .....

To .....

Signed .....



[FROM PAGE 109]

The passage of this law follows similar action by the Minnesota Legislature of 1941 when it passed Chapter 58, Minnesota Laws of 1941, which prohibited all state, county, municipal departments or agencies from using their purchasing facilities to secure merchandise for personal use of any officials or employees connected with such departments or agencies.

The law has had the backing of electrical groups in the state. Business leaders in all phases of retail and wholesale distribution felt the need and benefit of regulation of this type, and consider it of utmost importance in the postwar period.

## BLACKOUT SWITCHING

Disapproval of the blackout practice of throwing master switches, thus shutting off elevator service, radios, refrigerators, pumps and ventilating equipment in many large buildings has been expressed by James M. Landis, Director of Civilian Defense.

This position is in accordance with official interpretations of Air Raid Protection Regulations No. 1 for the Eastern Military Area, as prescribed by Lieutenant General Hugh A. Drum, Commanding General, Eastern Defense Command and First Army. The uniform signals prescribed last February 17 for the Eastern Military Area as part of these regulations are now in effect in all states except those of the Western Defense Command, where a different system is used to meet conditions in that area.

The question concerning the operation of elevators has been raised in many large cities. Whether they will be stopped during either the Blue or Red period will depend upon whether any lights are visible from the outside as a result of their use. If such lights are blacked out, it is recommended that elevators run on as normal a schedule as possible during the Blue and that emergency operation during the Red be considered.

## LIGHTING FIXTURES INVENTORY

Information on inventories of non-industrial fluorescent lighting fixtures held by wholesalers, retailers, manufacturers and assemblers was presented to the WPB Fluorescent Lighting Fixture Industry Advisory Committee at its recent Washington meeting. Data had been requested by the Building Materials Division from the 7,000 firms that had reported inventories of non-industrial fixtures in June, 1942.

Of the 5,600 firms which replied, 4,600 reported that they no longer had any inventories. Fixtures held by the remaining

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1,000 firms, as of May 28, 1943, comprise 38,234 two and four lamp 40 watt fixtures and 16,332 other fixtures.

Limitation Order L-78 (Fluorescent Fixtures) was reviewed in the light of the inventory data and suggestions were offered for possible changes that would facilitate the distribution of existing stocks, now released only on rated orders. Members of the Committee were invited to submit further suggestions in writing.

Preliminary reports received from ballast and transformer manufacturers indicates that progress is being made in the simplification and standardization program now under way in this field. One company has reduced the types of ballasts manufactured from 50 to 8 and another has limited its production to 15 types. Lead lengths of copper wire have been reduced 25 percent by some manufacturers.

## MINNESOTA PERMITS TYPE EI SWITCH LOOPS

The Minnesota Electrical Inspectors Association, at a meeting on June 14, adopted a new ruling which amends Rule No. 83 which appeared in their May 1943 Bulletin and corrects an error in Section 800 Wiring Methods of the War Emergency Supplement applying to the 1940 Minnesota Farmstead Wiring Regulations.

Rule No. 83 Amended reads as follows:

"Non-metallic sheathed cable containing one rubber insulated Type R conductor and one rubberless Type EI, or Type SB or Type WP conductor may be used for a concealed switch loop within a dry wall for the control of one, two or three lighting outlets; provided the Type R conductor is used as the hot wire to the switch and the rubberless insulated conductor is used as the return conductor from the switch to the outlet. This is a war emergency ruling and will be withdrawn as soon as proper wiring materials are available.

"The use of cable containing only Type R (or better) insulation for switch loops is strongly recommended, and the permission granted above should be used only when absolutely necessary.



**FARM WIRING PROBLEMS** hold the attention of (L to R) A. C. Fisher, Triumph, Minn. contractor; Edw. R. Kent, Supt. of the Municipal Power Plant at Mora, Minn., and D. A. Hilger, Minneapolis, past-president of the Minnesota Electrical Inspectors Association, at the recent N.E.E.I. War Conference.



*Aid in today's emergencies*  
**KLEIN'S**

Communication lines are jammed with vital messages — power lines are carrying greater loads than ever before. To keep lines working in the face of today's emergencies is the job that Public Utilities are ably performing.

The ability of Klein quality equipment to meet the demands of this unusual service is proving the foresight of those men who demanded the best when purchasing pliers and climbers, safety straps and belts, grips and wrenches.

Of necessity, Klein production today is largely devoted to supplying the needs of the Army and Navy. It is important therefore that every piece of equipment in civilian use be properly cared for to assure its delivering the long life which is inherent in any product carrying the name KLEIN.

To aid in making tools last longer, give better service, Klein has prepared a booklet, "Long Life to Tools," a copy of which will be mailed to anyone interested.

**ASK YOUR SUPPLIER**

Foreign Distributors: International Standard Electric Corp., New York

*This book on the care and safe use of tools will be sent without charge on request.*



**Mathias KLEIN & Sons**  
Established 1857 Chicago, Ill., U.S.A.  
3200 BELMONT AVENUE CHICAGO

When  
"KNOW-HOW"  
is important

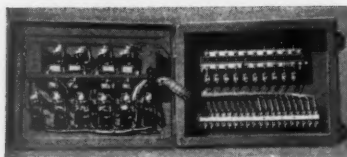
let  
**MILLER**  
do it!

The South's largest general electrical contractor offers you the experience gained from millions of dollars worth of successfully completed contracts for Army, Navy and civilian projects of all kinds including structural work and public utilities distribution systems.

Full equipment and engineering staff available to service any contract, regardless of size.

**Miller Electric  
Company**

556 Riverside Ave.  
Jacksonville, Florida



**Marine Electrical  
Specialties**

**A**ll types of electrical specialties, boxes, cabinets, control panels, duct-work, etc., manufactured by an organization accustomed to meeting exacting Army and Navy specifications. Full engineering personnel and equipment for manufacture of special electrical items in addition to all standard articles.

Write for information.

**Jacksonville Metal  
Manufacturing  
Company**

JACKSONVILLE, FLORIDA

*In the News*

[FROM PAGE 111]

### L-63 AMENDED TO EXCLUDE COPPER CABLE

An amendment has been made to Limitation Order L-63 which establishes "maximum permissible inventory" to an inventory (owned or consigned) of supplies of a total dollar value at cost (by physical or book inventory, at the option of the supplier) equal to the sales of such supplies at net sales figures, shipped from his inventory, during the three or four preceding calendar months depending upon the location of the supplier.

Certain exceptions are made to this "maximum permissible inventory." Further, the provisions of the order do not apply to any supplier whose total inventory at cost including consigned stocks of all supplies, is less than \$35,000.

The amendment adds to List A, paragraph (9): bare or insulated wire or cable for electrical conduction made from copper or copper base alloy.

Thus in computing the inventory value of supplies, bare or insulated wire or cable can also be excluded from the monthly report.

### YOUNG AGAIN HEADS N. C. E. I.

H. E. Young was reelected chairman of the North Central Electrical Industries at a meeting of the Board of Directors in Minneapolis, June 25. Other officers reelected for another year include: H. H. Chapman, vice-chairman; L. G. Mample, treasurer; and Wm. A. Ritt, secretary-manager.

Representing the various industry groups on the present Board of Directors are: F. M. Tripp and Wm. A. Ritt—Electrical Contractors; H. H. Chapman and C. J. Piemeisl—Electrical Manufacturers; L. G. Mample and D. E. Ford—Electrical Wholesalers; Geo. H. Johnston and C. J. Christopher—Electrical Dealers; H. E. Young and C. S. Kennedy—Commercial Utilities.

### CONSTRUCTION GUIDE

Requirements for construction projects should be in line with the revised version of the "Critical Construction Materials Design Guide" prepared by the Conservation Division of the War Production Board.

Formal instructions to this effect are incorporated in Form WPB-617, formerly PD-200. The following statement appears in the Application for Authority to Begin Construction pursuant to order L-41: "Applicants must be guided by the 'Directive for Wartime Construction' as well as by 'Critical Construction Materials Design Guide' of the War Production Board."

### TIME SWITCHES

TRIPLE POLE  
DOUBLE POLE  
SINGLE POLE

All three types can be furnished with capacities ranging from 20 TO 200 AMPERES PER POLE, listing from \$16.50 up. Ten ampere Time Switches from \$3.95 up.

### PROCESS TIMERS

INTERVAL TIMERS, or PROCESS TIMERS, are furnished in two types. One is reset by hand (manual); other resets itself, automatically. Both types can be provided for practically any cycle of time, fully adjustable from zero to maximum period. SYNCHRONOUS, SELF-STARTING MOTORS.

### SIGNAL TIMERS

Used extensively for starting and stopping industrial work; school class periods; for municipal time signals, etc. Up to six signal periods, permanently set at factory with Sunday & Holiday Cutout and Manual Control, at a list price of only \$35.

Write for Information

**AUTOMATIC ELECTRIC MFG. CO.**  
MANKATO, MINNESOTA

### Safe-T-Glow

HIGH TENSION  
DETECTOR



**SAFETY RULES** call for that EXTRA precaution and additional RECHECK which SAFE-T-GLOW provides. Detects accidental tie-ins, crossovers, leakages and induced voltages... prevents serious injury and loss of life. SAFE-T-GLOW consists of a sensitive Neon tube, amplified by mirror reflector.

Model A for circuits 2,000 to 35,000 volts.  
Model B for circuits from 35,000 to 220,000 volts.

### TEST-O-LITE

Tests Everything Electrical  
from 100 to 550 Volts

Equipped with Neon light which tells instantly where trouble lies in circuits, fuses, cut-outs, meters, etc. Indicates hot or grounded wires. Tells AC from DC. SAVES PRECIOUS TIME. Has PATENTED safety features. Vest pocket size with clip. Lifetime guarantee. List Price \$1.50 at leading jobbers.

**L. S. BRACH Mfg. Corp.**  
55-63 Dickerson St. Newark, N. J.



Outlining the items of construction which are permitted by WPB for projects approved as essential to the war effort, the Guide is designed to assist engineers and architects who are responsible for planning proposed projects. If the policies as stated in the Guide are maintained in the selection of materials, the work of processing the applications will be greatly reduced and final action will be expedited.

Excepted from the scope of projects to which the Guide applies are the following classifications: housing projects, which are governed by the War Housing Critical List; command construction projects, which are certain military projects ordered by the Chief of Staff, U. S. Army, or by the Chief of Naval Operations, U. S. Navy, and construction projects for which the Army, Navy and Maritime Commission are the claimant agencies under the Controlled Materials Plan. Both of the latter types of construction are governed by the Army and Navy Munitions Board "List of Prohibited Items for Construction Work."

Copies of the Guide may be obtained from the Regional or District Office of the War Production Board or from the WPB Conservation Division, 1100 H Street, N.W., Washington 1, D. C.

#### ARMORED CABLE

The amendment to General Limitation Order L-165 issued on May 19, prohibiting the manufacture of armored cable as defined, has been revoked by WPB as of the date of issue and the original order, effective September 30, 1942, was reinstated without interruption.

Under the terms of the September order, now again in force, the manufacture of armored cable used as a conductor of electricity in interior wiring systems is prohibited. This type is commonly known as "BX" cable. The amendment redefined armored cable to include many other types and as a result the prohibition against manufacture was extended to armored cable essential for many war products and war activities.



**E. L. BAILEY**, Chief Electrical Engineer, Chrysler Corp., points out the importance of a skeleton provision for future plant electrical system expansion, at the recent Midwest Power Conference in Chicago.

Electrical Contracting, August 1943

... And here's the IDEAL Solution to the Problem!

**An ALTERNATE and IMPROVEMENT for Solder and Tape Wire Joints.** IDEAL "Wire-Nuts" (Solderless, Tapeless, Wire Connectors) contain no copper or copper alloys—no Tin or Rubber as used with solder-and-tape joints. Because "Wire-Nuts" do not require these critical materials, they are *immediately available*. They help Speed Your Job—and Help Speed Victory; every time you use "Wire-Nuts" you *conserve vital materials* needed for the war program. Easy to use; strip wires, screw on, that's all!



#### Better Electrically, Stronger Mechanically

"Wire-Nuts" powerful grip on wires prevent shorts, grounds and corrosion,—and they withstand several times greater pull than the best soldered joint.

Fully Approved. Listed by Underwriters' Laboratories, Inc. Sizes for connecting all combinations from two No. 18 to three No. 10 solid or stranded wires.

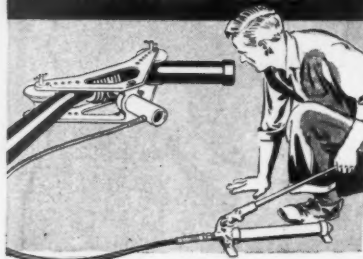
If your Electrical Jobber hasn't a supply, kindly write or wire, mentioning Jobber's name.

Prompt Delivery

1041 Park Ave., Sycamore, Ill.

Sales Offices in all Principal Cities

## JUST THE "TICKET" for Speeding Up Wartime Work



### Low-Cost BLACKHAWK Pipe Bender has EVERYTHING!

- COMPACT
- PORTABLE
- ONE-MAN OPERATION
- ON-THE-JOB ACTION
- BENDS PIPE AND RIGID CONDUIT FROM 1" TO 4"

You bet! — and Blackhawk Hydraulic Pipe Benders operate at any angle — avoid kinking, save need for heating or cutting and threading and use of elbows and couplings. Compact 10 or 20-ton ram and big range of attachments also handle many other bend, straighten, press, push, pull, spread and clamp jobs.

Right — Easy to operate even on ladder. Below — Rolls right to the job.



#### MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY  
Dept. P2083, Milwaukee, Wis.

Send full information about  
your Pipe Benders.

Name.....

Company.....

Address.....



[FROM PAGE 113]

### MORE MPR 251 INTERPRETATIONS

Although the examples in the following interpretations of MPR 251 refer to contractors in lines other than electrical, the instances are similar enough to those occasioned by electrical contractors to warrant careful investigation. These interpretations are issued solely for the purpose of guiding the decisions of the contractors as to the applicability of the order and price determinations thereof.

**Applicability** — Dismantling Works. A company which is engaged in constructing coal breakers and selling related supplies, contracted to dismantle a coal breaker, move it to a new location, and to mark and handle the structural parts in such a manner as to render the parts fit and accessible for re-use and re-erection. The contract for the dismantling project is covered by the Regulation.

**Exemptions** — Certification in Governmental contract. In order for a contract with a governmental agency to be excepted from the Regulation under Section 1397.53 (f), the agency must certify that the contract will be negotiated in accordance with a plan previously filed with OPA; a contract which merely provides that it is subject to renegotiation does not satisfy this requirement.

**Price Determination** — Sales on a cost-plus basis — "actual cost" of materials — discounts. In determining maximum prices for sales on a cost-plus basis, one of the factors considered is the "actual cost" of materials and supplies, Section 1397.56 (a) (1). As used in this section "actual cost" is the cost after all discounts, i. e., net cost to the contractor.

Actual cost of materials — calculation of margin. A painting contractor has on hand turpentine which he purchased at 32 cents a gallon in 1939; the March 1942 price is \$1.05 a gallon. He proposes to use the 32 cent turpentine on a job. In determining the "actual cost" of the turpentine under Section 1397.56 (a) (1), and the "estimated cost" under Section 1397.57 (a) (1), he must use 32 cents and not \$1.05. However, if the contractor charged \$1.05 for the turpentine in calculating the price of a similar job during the January 1, 1939 — March 1, 1942 base period, the difference between 32 cents and \$1.05 is a base period mark-up which may be considered in determining the "margin" under Sections 1397.56 (a) (4) and 1397.57 (a) (5), and will thus be included in the final determination of the maximum price. Where the contractor determines his maximum price under Section 1397.55, entitled "Maximum prices for sales not exceeding \$500," he may use the \$1.05 figure, since the prevailing rate rather than the actual cost of the material is used in that section.

Freight tax imposed by 1942 Revenue Act Pursuant to Supplementary Order No. 31 — Tax on Transportation of Property Imposed by Revenue Act of 1942, the 3 percent tax on freight bills is treated by the OPA as an increase in freight. Therefore, the amount of the tax actually incurred by the con-



FRANK E. SANFORD, distribution engineer, The Cincinnati Gas & Electric Co., reviewed the effects of wartime industrial development on post-war prospects at the recent meeting of the Kentucky Chapter, IAEL.

tractor may be included as part of the "actual cost" of the materials under Sections 1397.56 (a) (1), and it may also be considered in making the "estimated cost of materials" under 1397.57 (a) (1).

### REDISTRIBUTION OF USED MACHINERY

The Used Equipment and Machinery Industry Advisory Committee, meeting with War Production Board officials in Washington, was given an outline of a new and improved program for the redistribution of idle and used equipment and machinery.

The need for such a program was traced to the continued drain on essential war materials requested for production of new machinery and equipment, the disinclination of purchasers to use second-hand machinery, and the lack of adequate means of locating, inventorying and redistributing the large stocks of idle machinery and equipment in existence.

Basically, the plan is built around the use of the facilities of the 4,400 licensed used equipment dealers to locate, rebuild and negotiate sales of used equipment.

These dealers normally own at any one time approximately 15 per cent of existing used equipment, and have a knowledge as to the location of about 55 percent more. They are asked to report on all items of which they have any knowledge instead of only those which they own, as formerly reported to OPA on Form 2-01:P1 under the terms of OPA Maximum Price Regulation 136.

Their activities in this respect are to be supervised and assisted by the field personnel of the War Production Board assigned to that duty. These field representatives will augment the collected data by obtaining reports on a voluntary basis from the user-holders.

Under the plan, the WPB Redistribution Division will establish policies and procedures to facilitate the locating, inventorying and redistributing of all items of idle and excess machinery and equipment. The division is charged with the duty of

idle and excess machinery and equipment. The division is charged with the duty of assuring the collection of lists and the maintenance of inventories of the machinery and equipment at all WPB Regional offices for those items to be handled at the Regional level and in Washington, either in the division's Used Machinery and Equipment Branch or in the various industry divisions, of items in all regions.

In the future, requests for new equipment will be screened to determine the availability of used equipment as a suitable substitute. This screening is to be decentralized to Regional offices as far as possible.

The WPB industry divisions will continue to have the responsibility of approving applications for new production after the screening against the inventories of used equipment at the Regional level, and if unavailable there, at the national level in the inventory records at Washington.

Of prime importance to the successful operation of the program is the immediate collection of lists of available machinery and equipment from which substitutions must be made. As screening of PD-1A and PD-3A applications proceeds, the existence of such lists containing "live" items becomes imperative.

These active lists will be obtained through the use of "Want Lists" sent out to Regional offices and used equipment dealers from time to time, specifying items which are urgently needed for redistribution as determined by the experience of other agencies, industry divisions and regional offices.

## BUNA S REPLACES CRUDE IN RUBBER INSULATIONS

Sweeping WPB regulations affecting the manufacture of wire and cable will eventually replace all crude rubber with new synthetic rubber compounds in conductor insulations. Third quarter allotments to manufacturers are now divided 60 percent crude to 40 percent synthetic. Fourth quarter allotments will reverse the percentages. In 1944 rubber allotments for wire insulation will be 100 percent synthetic, probably Buna S.

Manufacturers' engineers claim that there will be no change in the appearance of the new insulation. In handling, installation, stripping and splicing, the new insulation will have the same characteristics as that made from crude.

The WPB order, R-1 issued June 18, 1943, and effective July 1, specific grade W-F compound for type R wire rated 0-600 volts and grade W-C compound for 601-5000 volts. Insulation for type RH wire is grade W-A compound. The grades correspond with performance references to the Code and ASTM standards. Jackets for portable cables will be made from neoprene and Buna S compounds.

Signal Corps, Navy, Army, Ordnance and other Federal specifications are keyed to the new synthetic compounds in the WPB order and Underwriters' Laboratory have issued a statement concerning approval and testing methods.

## Finer Appearance— Better Performance

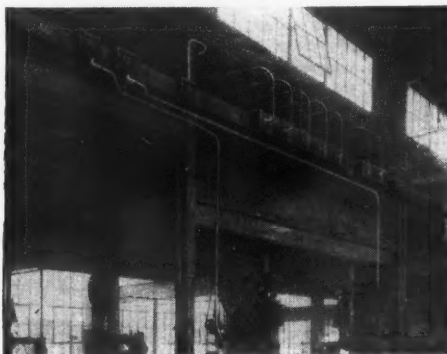
IN NEW LO-X *Ventilated* FEEDER BUS DUCT

**Yet It Saves Much Steel  
and Copper In Conformity  
with WPB Limitation Order L-273**

On Feeder runs, Bulldog's Ventilated Type LO-X Duct puts more power through to branch circuits with less voltage drop. The screened casing not only improves appearance but prevents excessive heat—cuts weight—conserves a maximum of critical materials.

At the same time, Ventilated LO-X shares all the basic advantages of Bulldog BUStrribution Duct design. It is quickly and easily installed—has full asset value—is 100% salvable.

LO-X Ventilated Bus Duct for Main Feeders is available in the new WPB ratings of 800A, 1000A, 1350A, 1600A and 2000A. Single-phase, 3-phase, and 3-phase 4-wire; 600 Volts or less.



### Flexible Light and Power

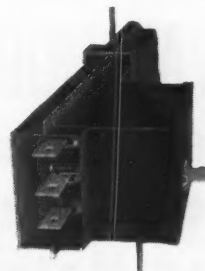
(Above) This shows a Branch Circuit run of BUStrribution DUCT with circuit protective devices plugged in at points most convenient to the machines they energize and protect. Each 10-ft. section of plug-in duct has 10 outlets for the insertion of these plugs, which can be readily moved with the machines and instantly plugged in at any other desired location. It is 100% flexible and salvable.

Capacities available under new WPB standards are 250A, 400A and 600A for branch runs of Plug-in Bus Duct.

MANUFACTURERS OF a complete line of Vacuum Break Safety Switches, Panelboards, Switchboards, Circuit Master Circuit Breakers and BUStrribution SYSTEMS.

You SAVE when you SPEND on WAR BONDS

### Plug-in Type for Branch Circuits



(Right) End view of a branch circuit plug mounted on a bus duct section. Note how the copper "contact fingers" of the plug, inserted through a plug-in opening in the duct casing, clamp over the busbars in the duct.

Wiring between plugs and machines is made in short runs of rigid or flexible conduit.

Plugs may be of the fusible switch type or automatic circuit breaker type and are readily interchangeable. Capacities: 30A to 600A; 600 Volts or less.

**BULLDOG**  
ELECTRIC PRODUCTS CO.

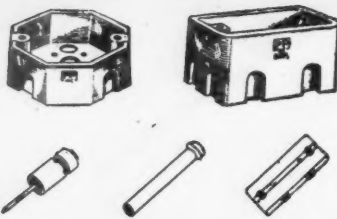
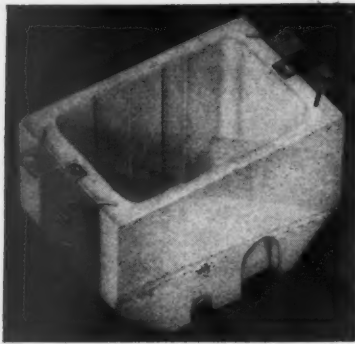
Detroit, Michigan

Bulldog Electric Products of  
Canada, Ltd., Toronto, Ontario

Field Engineering Offices  
in All Principal Cities







## Porcelain Meets WAR HOUSING Requirements for Non-Critical Wir- ing Materials

The War Housing Critical List, the Critical Materials Design Guide, the List of Prohibited Items for Construction Work, War Department Specifications—all require the use of non-metallic, or PORCELAIN Outlet Boxes and non-metallic type, or Knob and Tube Wiring Construction.

You can speed installation of every wiring job by stocking Porcelain Products' Porcelain Outlet Boxes, Surfolets Knobs, Tubes, Cleats and other non-metallic wiring materials.

Write for your FREE copy of Installation Manual on Porcelain Protected Wiring Systems.

**PORCELAIN PRODUCTS, Inc.**  
FINDLAY, OHIO



[FROM PAGE 115]

### COMING MEETINGS

**International Association of Electrical Inspectors**—Northwestern Section, Seattle, Wash., New Washington Hotel, August 26 and 27. Southwestern Section, Los Angeles, Calif., Mayfair Hotel, Week of August 30. Western Section, Chicago, Ill., LaSalle Hotel, September 13-15. Eastern Section, New York, N. Y., Week of September 20. Southern Section, New Orleans, La., Roosevelt Hotel, September 27-29.

**International Association of Electrical Leagues**—Eighth Annual Conference, Netherland Plaza Hotel, Cincinnati, Ohio, Sept. 16-17.

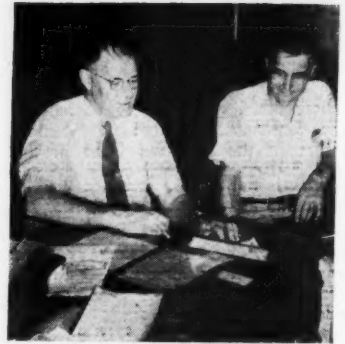
**National Electrical Contractors Ass'n**—Annual Meeting, Hotel Drake, Chicago, Ill., Oct. 10-11.

### INTERPRETATION OF FUSE ORDER

Prohibition on the use of copper or its alloys, established by General Limitation Order L-161 (Electric Fuses), applies to (1) metal exterior threaded ends attached to the fibre of renewable electric fuse tubes and (2) washers used to hold fuse links in renewable fuses, according to Interpretation No. 1 of that order issued by the War Production Board.

Under the terms of the order, no copper or copper base alloys may be used to manufacture fuses or fuse parts except parts that carry electric current. Questions have arisen as to whether metal ends and washers are conductors of electric current.

Interpretation No. 1 makes clear that these parts are not current-carrying parts and are therefore not exempt from the prohibition on the use of copper or its



**EMERGENCY RESTRICTIONS** on electrical construction are given careful study by Raymond G. Olive (left), purchasing agent; and Roy C. Macband, supt. of construction, of the Olive-Markel Electric Company, Louisville, Ky., electrical contractors.

alloys. Metal ends and washers come in contact with the current-carrying part of the fuse and have an electrical potential present, the Interpretation points out, but the successful operation of the fuse does not depend upon their current-carrying ability.

### USED EQUIPMENT SAVE VITAL METALS

Sufficient critical materials have been saved through the use of used equipment and machinery in place of new equipment to build 17,000 four-ton block busters, so reported Donald M. Nelson, Chairman of WPB.

"The used equipment and machinery dealer is to be highly commended for his efforts," Mr. Nelson said. "Numerous instances have come to our attention in which a dealer has re-engineered a piece of equipment to fill a vital need, even though the machine originally was manufactured to do something else. Thus, projects which would have been delayed pending the building of new equipment have been able to go ahead immediately."

Mr. Nelson pointed out there was still a vast reservoir of idle and surplus used machinery and equipment. He urged holders to either sell their equipment immediately to dealers or to list it as available for sale with the Redistribution Division of the nearest WPB field office. Each office maintains an active file of available used equipment so that prospective purchasers can be referred to sources of supply.

### MATERIAL CONSERVATION ON SWITCHGEAR

Strict conservation of critical materials and simplification of types in the manufacture of power switchgear and high voltage electric insulators has been ordered by the War Production Board.

Schedule IV will permit an estimated saving of more than 3,000 tons of carbon steel and two million pounds of copper



**J. J. SIDDALL**, electrical engineer, H. H. Robertson Co., Pittsburgh tells delegates to the Kentucky Chapter, IAEL meeting in Cincinnati, O., of the need for standardized building codes and closer cooperation between building departments and electrical inspection departments.

*Electrical Contracting, August 1943*

annually in the manufacture of power switchgear. Important steps in the conservation program are:

1. Operating all copper current carrying parts at higher current densities than those previously accepted as standard by the industry.

2. Eliminating many portions of steel enclosures and reducing the gauge of steel in others.

3. Substituting wood or other materials for structural steel in the fabrication of outdoor substation structures.

4. Eliminating duplicate connections, unnecessary hardware and non-essential instruments.

Schedule IV is concerned otherwise largely with reducing the number of types of high voltage insulators that may be manufactured. The number of cap and pin type suspension insulators, for example, has been reduced from 44 to eight. Similar reductions have been effected in the number of designs of post type insulators.

One important feature common to both schedules is the elimination of non-essential tests. It is common practice in the industry, it was pointed out by the Office of War Utilities, for producers to make "destruction" tests on equipment of the same type which already has given satisfactory service and for which test data is established. No tests may be made in the future where such information already is available.

## REGISTER IDLE RESISTANCE WELDING EQUIPMENT

Resistance welding equipment now comes under general Limitation Order L-298. It requires that the manufacturer must file with WPB an operations report on Form WPB-2830, showing orders for new and rebuilt resistance welding equipment and repair parts unfilled, received, shipped and cancelled during the preceding month. This report shall not apply to orders for electrical circuit breakers or in-



**PAUL H. GOODELL**, electrical engineer, The Trumbull Electric Mfg. Co., Norwood, Ohio, explains convection heat and enclosed infra-red ovens to electrical inspectors and contractors at a recent meeting of the Kentucky Chapter, IAEI in Cincinnati.

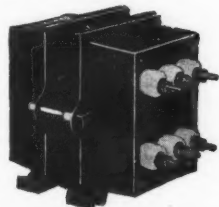
# Have you transformer troubles?

## TRY Newark TRANSFORMERS

*Standard or Special*



**Oil Cooled Transformer**  
for Plate Supply Furnace, Welding, etc.



**For Electronic Applications**

If your difficulties involve transformer performance, why not use our twenty years of experience to iron them out. If the job calls for a standard dry type transformer, you will find just what you need in the NEWARK line. If it is a special transformer job, you will find in the NEWARK staff the brains and experience to design the transformer you need, and in the NEWARK shops the components required to assemble it, and the skilled workmanship to do it right.

Are your difficulties based on delayed deliveries? Well, the reputation of NEWARK for unusual delivery always has been good, and still is. Let us confirm this, on your job.

*Full details on Newark Transformers, Dry Type or Oil Cooled Distribution Type, in descriptive bulletins on request.*

## Newark TRANSFORMER CO. 17 FRELINGHUYSEN AVE. NEWARK, NEW JERSEY

OUR SUBCONTRACT FACILITIES may be just what you need to meet delivery needs on war production. We established this department long before Pearl Harbor, and it is skilled in handling all kinds of work, not only electrical in character.

Phone: BIGELOW 3-5600

NEWARK TRANSFORMER CO.

17 Frelinghuysen Ave.

Newark, N. J.



● It's certainly easy—and profitable, too—to service electric refrigerator motors of the popular capacitor-starting type, the Aerovox way. No guesswork. No experimentation. No loss of time and effort. Just note:

#### The Aerovox way . . .

- Check up motor nameplate for type number or other identification.
- Look up that motor type designation in latest Aerovox listing. This gives you the exact duplicate replacement, or, when feasible, the universal replacement. Either one assures a satisfactory job.
- And best of all, your local Aerovox jobber carries an adequate stock for your convenience.

#### ● See Our Jobber . . .

Order your replacements from him. Ask for latest Aerovox motor-starting capacitor catalog. Or write us direct.

**AEROVOX**  
Capacitors  
INDIVIDUALLY TESTED

AEROVOX CORP., NEW BEDFORD, MASS., U. S. A.  
In Canada: AEROVOX CANADA LTD., HAMILTON, ONT.  
Export: 100 VARICK ST., N. Y. C. • Cable: 'ARLAB'



[FROM PAGE 117]

dicating or recording apparatus used with resistance welding equipment, or repair parts for such circuit breakers or indicating or recording apparatus.

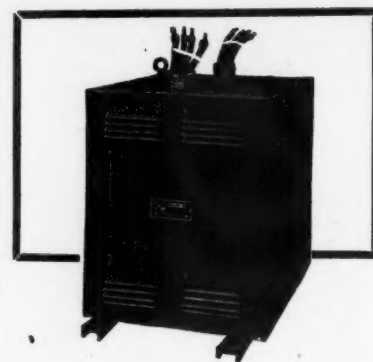
No manufacturer or dealer shall accept an order for, or deliver any new resistance welding equipment unless the order or delivery is specifically authorized by the War Production Board on Form WPB-2752. Application for an authorization, and for a preference rating if none has been previously assigned, is to be made by the purchaser by filing form WPB-2752, in duplicate, with the War Production Board as explained in the instructions which accompany the form.

The provisions of the above paragraph shall not apply to (1) any order of \$200 or less for resistance welding equipment; (2) any order for resistance welding electrodes; (3) any order for resistance welding equipment for direct use by the Army, Navy, Maritime Commission or War Shipping Administration or for incorporation in or attachment to any resistance welding equipment to be used directly by such agencies; (4) any order bearing a preference rating assigned under Preference Rating Order P-19-h; provided that, notwithstanding paragraph (g) (4) of Priorities Regulation 3, the certificate applying or extending such rating shall state the source of the rating; or (5) any order placed by a manufacturer of, or dealer in, resistance welding equipment.

Whenever any used resistance welding equipment (other than portable gun welders and resistance welding electrodes) has been idle for a period of ninety (90) consecutive days ending on or after July 12, 1943, without having had its ownership changed, the owner of the equipment shall register it, within thirty (30) days after



**POWER FACTOR** demonstration is given inspectors and contractors by Chas. McL. Moss, district engineering and service supervisor, Westinghouse Electric & Mfg. Co., Cincinnati at meeting of Kentucky inspectors.



## AIR-COOLED TRANSFORMERS

Up To 50 KVA Up To 2400 Volts

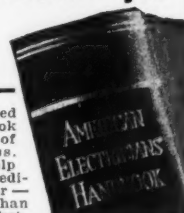
Acme standard air-cooled transformers are heavy-duty design, built for economical, efficient, continuous performance. Buy quality, specify Acme air-cooled transformers in ratings from 3 KVA to 50 KVA, 3 phase 60 cycle, 240/480; 600; or 2400 volt primary; 1½ to 50 KVA, 60 cycle single phase, 240/480; 600; 2400/4160 volt primary. Write for Bulletin 160.

**THE ACME ELECTRIC & MFG. CO.**  
36 Water St. Cuba, N. Y.



## HOW TO handle every type of electrical job

—quickly  
—accurately



Thousands have used this famous handbook as a working guide of everyday usefulness. NOW it is ready to help you too, in a big 5th edition — 600 pages larger — up-to-date — more than ever the one great pocket-book of practical electricity for you.

1600 pages, 1177 illustrations, \$5.

## Croft's AMERICAN ELECTRICIANS' HANDBOOK

Revised by C. C. Carr, Pratt Institute

This book is packed from cover to cover with the facts every man doing electrical work needs to have constantly at hand—from fundamentals of electricity to remedies for electrical equipment troubles. Helps you install commercial electrical apparatus and materials intelligently, operate electrical equipment efficiently, and maintain it at high operating efficiency.

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Company ..... F. E. C. 8-43

Electrical Contracting, August 1943



the ninety (90) day period, by filing Form WPB-2732 with the War Production Board. For the purpose of this subparagraph used resistance welding equipment shall be deemed to be idle for a period of ninety (90) consecutive days, unless, during any such period, it has been employed for welding operations for more than one hundred twenty (120) hours in the aggregate.

Within five (5) days after any used resistance welding equipment registered under the above paragraph has been sold, the seller shall register such change of status by filling with the War Production Board Form WPB-2732 as explained in the instructions which accompany the form.

## *Priorities*

### USED ELECTRIC MOTORS

Members of the Used Electrical Equipment Dealers Industry Advisory Committee, meeting with War Production Board officials in Washington, urged that the Government promote a program for the scrapping of unrepairable old electric motors.

The Committee also recommended the general use of stock lists for the interchange of information among dealers and asked the Government to prepare a standard form which could be used by all dealers.

Another recommendation was that an order be issued limiting the number of lead wires to the minimum number required for normal operation of the type of motor being rebuilt.

WPB officials told the Committee that rebuilding of used equipment was considered the same as repairing, and the same consideration would be given on their applications for materials when submitted on CMP-4B. It is not necessary for a dealer to obtain a rating from his customer for a used motor or for repair work, but it is helpful for him to show all ratings received higher than AA-2.

### MOTOR CONTROLLERS

A number of minor changes are made in the general conservation order (L-250) covering electric motor controllers by an amended version of the order issued by WPB. Among the changes are:

Exemption from the requirement in the original order that purchase orders for electric elevator controllers or parts of controllers must bear preference ratings of AA-5 or higher. Elevators and parts of elevators come under the provisions of Limitation Order L-89.

# Permalector NEW INDUSTRIAL UNITS FOR *Lower* MOUNTINGS

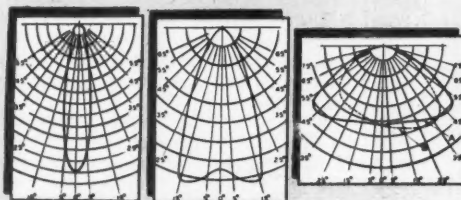
- Four Mounting Arrangements
- Three Light Distributions

Where units may be mounted 20 feet or less from floor level, these new Permalector units provide the SIMPLE, INEXPENSIVE, and HIGHLY EFFICIENT WAY to obtain adequate lighting of the work plane.

Immediate delivery. Quickly installed, ready for service, simply by connecting wiring. Increase the light output from your present wiring system. Units are available in four different mounting arrangements, three light distributions - concentrated, medium, and broad, for lamp wattages from 100 to 500 watts.

### A PERMALECTOR UNIT FOR EVERY LIGHTING PROBLEM

For high bay mounting, for intermediate and low bay mounting . . . for mounting 6 to 60 feet and more above the work level . . . for concentrated, medium, or broad light distribution . . . there is a Permalector to meet your requirements. What can we light for you? Write!



**Silvered Glass  
Will Do It  
Better!**

Permalectors save on first cost and after cost. They are "shaped-mirrors" of silvered glass, delivering the maximum flux of light where needed and wanted. Permalectors will not discolor, check, crack, nor peel. They stay clean longer!

## PITTSBURGH REFLECTOR CO.

MANUFACTURERS OF LIGHTING  
EQUIPMENT AND THE FAMOUS

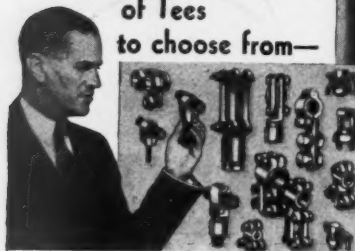
*Permalectors*

OLIVER BLDG. PITTSBURGH, PENNA.

Please send Industrial Lighting Supplement  
No. 2. EC-43

Name.....  
Company.....  
Address.....

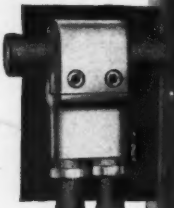
"You have **ALL Types**  
of **Tees**  
to choose from—



—in the **COMPLETE line**"

All in one catalog, for your handy selection—every good type of tee connector... Each one carefully designed and tested, and manufactured under rigid engineering supervision.

**Penn-Union Type HFM**, with one-bolt or 2-bolt hinged clamp for the main. One or more branches can be connected afterward. Multi-slit tapered sleeve assures permanent grip on branch.



**Penn-Union Hinged E-Z Tee** takes a wide range of branch sizes. One-piece design makes installation easy. Tap connections can be made at any time.



**Clamp Type Tees** for all sizes of tubing and cable—a complete line. Machined contact surfaces.

**Types for All Combinations**—for connecting flat bar, run or tap, to tubing or cable. Also "general utility" tees that take a wide range of conductor sizes.



**Penn-Union E-Z Tee** is ideal for accommodating a large range of conductor sizes on both the main and branch. Will not loosen. 2, 3 or 4-post.

Penn-Union fittings are preferred by utilities, industrials, electrical manufacturers, contractors—because they have found that **Penn-Union on a fitting is their best guarantee of Dependability.**

**PENN-UNION ELECTRIC CORPORATION**  
ERIE, PA. Sold by Leading Jobbers

**PENN-UNION**  
Conductor Fittings

*In the News*

[FROM PAGE 119]

Addition of controllers from motorized fire equipment to the list of uses exempt from the provisions of the order.

A number of other minor changes are made to avoid ambiguity.

The War Production Board has also issued an interpretation to L-250.

Floating dry docks, according to the interpretation, are considered ships for the purpose of the orders; electric motor controllers delivered for use aboard dry docks thus share with ships in the exemption from the restrictions imposed by L-250.

## COPPER WIRE FOR FARMERS

A retailer who receives an order for copper wire supported by a "Copper Wire Allotment Certificate" issued to a farmer by a County USDA War Board may treat the certificate just as though it were an allotment. He may place an order on a warehouse or mill for the amount of copper wire shown in the certificate and attach the certificate to it. An order with such a certificate attached placed by a retailer with a warehouse or mill is an authorized controlled material order and has the same effect as any other authorized controlled material order under CMP regulations. Or, if the retailer prefers, he may place an authorized controlled material order for the amount of copper wire shown in the certificate by placing on his order the allotment number appearing on the certificate followed by the quarterly identification and endorsing the order with the certificate set out in paragraph (s) (3) of CMP Regulation No. 1 or the form of certificate shown in CMP Regulation No. 7. The retailer may not, however, use both methods of placing authorized controlled material orders on the basis of "Copper Wire Allotment Certificates" during any one calendar month.

A retailer must fill orders accompanied by a "Copper Wire Allotment Certificate" in the order in which received and must give preference to such orders over orders supported by preference ratings alone.

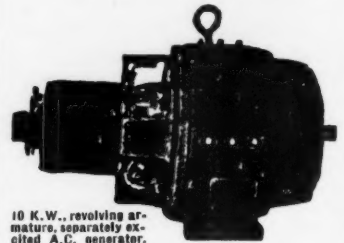
A warehouse receiving an order from a farmer or retailer for copper wire supported by a "Copper Wire Allotment Certificate" must treat the order just as though it were an authorized controlled material order.

## ALLOTMENT OF ELECTRICAL SUPPLIES

All rated orders for wire and cable were declared invalid June 30 unless they were accompanied by an allotment of materials under the Controlled Materials Plan.

This means that unfilled orders for wire

## 110-VOLTS A. C. ANYTIME, ANYWHERE WITH KATOLIGHT GENERATORS AND POWER PLANTS



10 K.W., revolving armature, separately excited A.C. generator.

Furnish same kind of current as city power lines for operating standard A.C. portable electric tools, transmitters, receivers, floodlights, etc.

Good deliveries on A.C. generators, 350 through 15,000 watts. Available in all standard voltages 110, 220, single phase, 2 or 3 wire, three phase or three phase four wire. Frequencies 25, 30 or 50 cycle on specification.

Kato's entire production at present must be confined to orders with high priorities.

Also manufacturers of a complete line of rotary converters

**KATO ENGINEERING CO.**  
530 Front St. Mankato, Minn.

Where **LIGHTS**  
must **NEVER**  
**FLICKER--**



Depend on **ZENITH**  
to keep 'em shining!

**ZENITH**

Automatic Transfer Switch

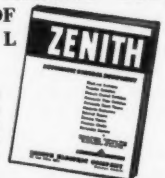


Zenith throws current to emergency—and back in 1/25 sec. Electrically held. Operates A.C. to A.C., A.C. to D.C., any combination. 1, 2, 3, 4, poles.

18 capacities. 30 to 400 amps. Also made electrically operated, mechanically held.

GET **ZENITH CATALOG** FOR FULL LINE OF CONTROL EQUIPMENT.

Contactors, Time Switches, all types Timers, Program Clocks. Controls for special jobs. Wire or write



**ZENITH ELECTRIC COMPANY**  
155 W. Walton St., Chicago 10, Ill.

and cable submitted under the Production Requirements Plan to electrical wholesale distributors have been automatically cancelled unless a CMP allotment has been made.

However, it was emphasized, CMP provides for procurement of certain warehouse replacement stocks which is not affected by the June 30 cancellation date and can be obtained without the use of allotment numbers. That is, electrical warehouses may ship on both authorized controlled material orders and preference rated orders under the provisions of CMP Regulation No. 4, providing shipment is made from warehouse stock.

Directives have already been issued to wire and cable manufacturers to set aside certain percentages of their production capacity for warehouse replacements.

Availability of raw materials for non-military electrical items is not too bright at the present time. The copper situation, particularly, is still tight, and officials have indicated that any additional production which is realized will be used for direct war purposes.

It has been suggested that steps be taken to redistribute defense materials lying idle in various government projects. It has also been suggested that plans be made now for orderly disposal of government-owned electrical equipment where excess stocks develop. Everything possible should be done to avoid the situation which arose immediately after World War I when government stocks put on the market resulted in disruption of normal distribution machinery.

### PREFERENCE RATINGS

A preference rating of AA-1 may be used by producers of hardboard to obtain maintenance, repair and operating supplies, and a rating of AA-2 has been assigned to drainage and irrigation activities for obtaining MRO supplies.

There are blanket ratings assigned to specified business activities by CMP Regulation No. 5, which governs maintenance, repair and operating supplies. The regulation has been amended to include hardboard in Schedule I, under "Building Materials", and drainage and irrigation has been added to Schedule II.

### FARM SUPPLIES

General Preference Order M-330, which provides for the setting aside by manufacturers and distributors of specified amounts of farm supplies for farm distribution outlets has been amended to provide that if a distributor's orders from farm distribution outlets for any enlisted item calls for deliveries in excess of the amount ordered set aside, he may prorate deliveries on the basis of normal shipments regardless of preference ratings (other than AAA).

Without this amendment, a distributor under such circumstances would have been required to fill orders on the basis of the preference ratings carried by the

# NEVER BEFORE

## A BALLAST LIKE THIS!

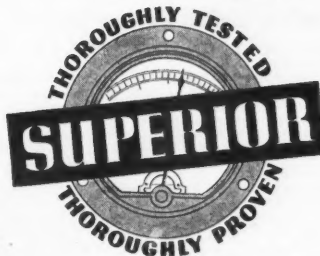


A Superior oscilloscope wave-form showing true power saving wave-form produced by Superior's patented ballast design, increasing foot candles and lengthened lamp life.

B Competitive oscilloscope wave-form produced by competitive ballasts of similar design, demonstrates approximate 25% loss of power and light output. This will result in complete blackening of lamp ends and shortening of lamp life.



A few users:  
Mitchell Mfg. Co.  
Westinghouse  
Elec. Supply Co.  
General Electric  
Supply Corp.  
Graybar Electric  
Company, Inc.  
Ruby Lighting Co.  
Progress Mfg. Co.  
Electro Mfg. Co.  
Lighting Products  
Corp.  
American Fluor-  
escent Co.  
L. J. Segil & Co.  
Solar Lighting Co.  
Van Dyke  
Industries



Not Just An Ordinary Ballast

It's CUSTOM and  
PRECISION BUILT  
THROUGHOUT!

Unbiased operating tests prove that Superior Ballast provides approximately 25% more lamp life than similarly designed ballasts. It was found that Superior Ballast also increased the useful light output of the lamps by retarding the blackening of the lamp ends. Ballast, engineered and manufactured in Superior's new plant, is of exclusive patented design—a design that overcomes the faults commonly found in ballast of less advanced design. There is a Superior Ballast made for every type of fluorescent unit.

WRITE FOR DESCRIPTIVE LITERATURE

AVAILABLE FOR  
IMMEDIATE  
DELIVERY

# SUPERIOR ELECTRICAL INDUSTRIES

DEPT. A— 2614 W. NORTH AVE., CHICAGO, ILLINOIS



## SEARCHLIGHT SECTION

(Classified Advertising)

**Employment      Business**  
**Equipment**  
(Used or Resale)  
**"OPPORTUNITIES"**

### UNDISPLAYED RATES

15 Cents a Word. Minimum Charge \$3.00. POSITIONS WANTED (full or part time individual salaried employment only), 1/2 the above rates payable in advance.

BOX NUMBERS—Care of publication New York, Chicago or San Francisco offices count as 10 words. DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions.

### DISPLAYED RATE

INDIVIDUAL SPACES with border rules for prominent display of advertisements.

The advertising rate is \$7.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. An ADVERTISING INCH is measured 1/2" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by Aug. 23rd will appear in the September issue, subject to limitations of space available.

## Electrical Public Relations Advertising Executive Available

Now Public Relations and Promotion Counsel to two important electrical associations. For ten years Advertising Promotion Manager electrical manufacturer. Creates plans that sell now or for the post-war period. Good organizer. Initiated war-time advertising and war plant conservation, employee training incentive production plans for employer. Familiar all markets as sales manager. Effective placing publicity. Good post-war ideas. Salary substantial. Employed. 44.

PW-304, Electrical Contracting,  
330 West 42 St., New York 18, N. Y.



**WE BUY & SELL**  
**MOTORS**  
**TRANSFORMERS**  
**MOTOR GEN. SETS**  
**OIL SWITCHES**  
**AIR CIRCUIT BREAKERS**



**ELECTRIC EQUIPMENT CO.**  
678 Lake Ave., Rochester, N.Y.  
Tel. Cleveland 678

### FOR SALE

4-500 KW D.C. GENERATORS  
4-200 KW D.C. GENERATORS  
230 Volt—250 R.P.M.  
Manufactured by:  
**BRITISH-THOMPSON-HOUSTON COMPANY**  
in 1927

**INDUSTRIAL SUPPLY COMPANY**  
P. O. Box 381      New Orleans, Louisiana

### FOR SALE!

**Complete Power Generating Plants!!**  
500 KVA AC—250 KW AC including Boiler,  
all Equipment in perfect operating condition.

**H. U. MANN**  
540 Lake Shore Dr.      CHICAGO



[FROM PAGE 121]

orders with the result that the higher rated orders would have been filled in full while those with low ratings or none at all might not have been filled even in part.

The list includes, among many other items, fractional horsepower motors and various types of batteries.

## AA-5 FOR FAN AND BLOWERS

General Limitation Order M-280 as amended deletes the former provisions requiring all manufacturers of fans and blowers to file monthly detailed delivery schedules. Selected manufacturers now file delivery schedules on Form PD-901 under the terms of General Scheduling Order M-293.

Other minor changes are made in the amended order to remove dates no longer applicable. Acceptance and delivery of purchase orders are now restricted to those with preference ratings of AA-5 or higher without regard to dates.

## WELDING ROD FOR MAINTENANCE

Welding rod used for manufacturing purposes may not be treated as an operating supply under CMP, even though it is carried as an operating supply under the manufacturers established accounting practice.

This ruling is contained in Direction No. 7 to CMP Regulation No. 5, which says that welding rod includes both arc welding electrodes and gas welding rods.

The Direction states that a manufacturer may use ratings assigned to him by CMP Regulation No. 5 for MRO, to obtain his requirements of such rod to repair his own equipment. However, such ratings may not be used to get welding rod for welding operations in the production of a product.

## HAND TOOLS FOR EMPLOYEES

CMP Regulation No. 5 now permits an employer to buy hand tools for his employees in the following cases: (1) Where the tools will belong to the employer and are only checked out to the employee; (2) Where the tools will be resold by the employer to the employee. Where the employer is unwilling or unable to use one of these two methods, the employee is not permitted to use a preference rating under the regulation, since he is not in business. This direction is issued to provide a way for employees themselves to get hand tools on their employer's ratings.

## KNOW ELECTRICITY AS EXPERTS KNOW IT



## —AND GET AN EXPERT'S PAY

What about your future? Who is safe today? Surely not the man who is contented to stand still! Know your job thoroughly—prepare yourself for jobs ahead. To do just this thousands of men have used

## The CROFT Library of Practical Electricity

7 Volumes, 2906 pages

1948 how-to-do-it illustrations

● The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hardheaded facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers.

● Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from planning it, to completion.

### NO MONEY DOWN

### EASY PAYMENTS

### 10 DAYS' FREE EXAMINATION

Fill in and mail the coupon below and we will send you the entire set of seven volumes for ten days examination on approval. We will take all the risk—you assume no obligation. If you decide to keep the books, send \$5.00 in ten days and the balance at the rate of \$5.00 a month.

### SEND THE COUPON NOW AND SEE THE BOOKS FOR YOURSELF

### EXAMINATION COUPON

McGraw-Hill Book Co.  
330 W. 42nd St., New York 18, N. Y.

You may send me the seven volumes of the Croft Library of Practical Electricity for 10 days' examination. I agree to return the books, postpaid, in ten days or remit \$3.00 then and \$3.00 a month until the special price of \$18.00 has been paid.

(To insure prompt shipment, write plainly and fill in all lines.)

Name .....

Home Address .....

City and State .....

Position .....

Name of Company.....EC-8-45

The employee of any person producing any product or conducting any business listed on Schedule I or Schedule II of CMP Regulation No. 5 may use the preference rating assigned by the regulation to his employer to purchase hand tools (including gauges and engineering instruments) which he requires for use exclusively in his employer's business and which his employer requires him to furnish.

## — WITH THE — *Manufacturers*

### Jefferson Elects New Officers

At a recent meeting of the board of directors of the Jefferson Electric Company, Bellwood, Ill., new officers were elected. John A. Bennan, former president, became chairman of the board; J. C. Daley, president and treasurer; and A. E. Tregenza, executive vice-president. At the same meeting James M. Bennan was made vice-president and general sales manager; A. A. Flick, Jr., vice-president, charge of manufacturing; and R. A. Hoagland, vice-



J. A. BENNAN



J. C. DALEY



A. E. TREGENZA



J. M. BENNAN

president in charge of war contracts.

Along with these changes in officers, four executive engineers have been appointed—E. G. Goddard in charge of commercial products; R. J. Horstmann, in charge of radio and electronic products; L. Maurer in charge of design and development; and E. W. Rickmeyer, in charge of mechanical products—also E. J. Banigan as director of purchases and H. F. Tobler as personnel director.

### G-E Changes

A new division of the Appliance & Merchandise Department of General Electric Company, to be known as the Resin and Insulation Materials Division, has been formed with E. L. Feininger as manager. The new division will be responsible for the manufacture, engineering and sales of



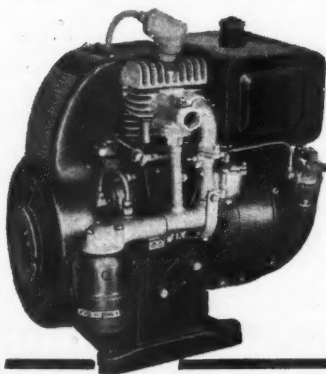
# ONAN

ELECTRIC PLANTS

## Electricity for Any Job—Anywhere

ONAN GASOLINE DRIVEN ELECTRIC PLANTS provide electricity in any location where it is not otherwise available, and for emergency and standby service.

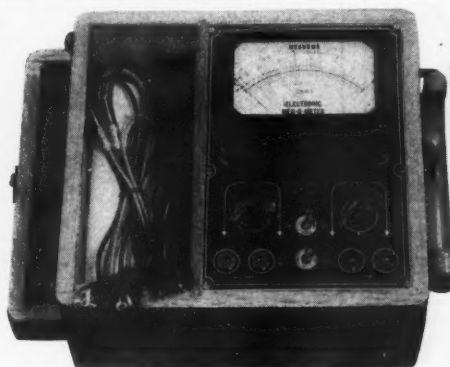
Thousands of these reliable, sturdy plants are doing a winning job on all the fighting fronts by providing power and light for many vital war tasks.



Ratings from 350 to 35,000 watts. A.C. 50 to 800 cycles, 110 to 660 volts. D.C. 6 to 4000 volts. Also dual A.C. and D.C. output models. Air or water cooled engines.

Details gladly furnished on your present or post-war need for Electric Plants.

**D. W. ONAN & SONS**  
800 ROYALSTON AVE. • MINNEAPOLIS, MINN.



THE MODEL  
610-E

## MEG-O-METER

A NEW  
**INSULATION  
TESTER!!**

OPERATES ON ANY 110  
VOLT 60 CYCLE A.C. LINE

INSTANTLY INDICATES THE EXACT LEAKAGE OF ALL INSULATION  
FROM ZERO UP TO

**200 MEGOHMS**

AT A TEST POTENTIAL OF

**500 VOLTS D.C.**

\* NO HAND CRANKING—The 500 VOLT POTENTIAL is made instantly available by simply throwing a front panel toggle switch.  
\* DIRECT READING—All calibrations printed in large, easy-to-read type enabling exact determination of leakage from 0 to 200 Megohms. In addition, the Megohm scale is also subdivided into BAD (0 to 1 Megohm) DOUBTFUL (1 to 3 Megohms) GOOD 3 to 200 Megohms sections. The BAD Section which indicates the danger point is printed in red.

\* The instrument is housed in a heavy-duty Oak portable cabinet.

\* Panel is of solid bakelite engraved by the new "cut in" process which eliminates possibility of letters being scratched off.

\* Meter movement—a 4 1/2" 0 to 200 Microampere sensitive meter guarantees extremely accurate readings on all ranges.

Model 610-E operates on 110 Volt 60 cycle A.C. current. Comes housed in beautiful hand-rubbed oak cabinet, complete with portable cover, test leads and instruction. Size 9 1/2" x 8 1/2" x 6 1/2". Shipping weight 16 pounds. Net Price.....**\$52.50**  
Model 610-B same specifications as above except battery operated. Price complete.....\$62.50

**SUPERIOR INSTRUMENTS CO.**

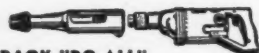
DEPT. C 227 FULTON ST.

NEW YORK 7, N. Y.

# WHERE TO BUY

Equipment, Materials and Supplies for  
Electrical Construction — Maintenance — Repairs

## DRILLS CONCRETE—METAL—WOOD

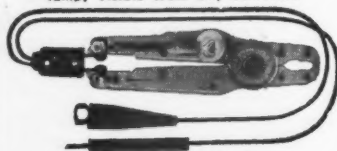


### WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1 3/8" dia.; metal to 3/4". Two tools in one. Easy to maintain. Universal motor. Star drills in 17 diameters. Also chisels, bull points, etc. Write for bulletin.

Wodack Electric Tool Corporation  
4628 W. Huron St. Chicago, Ill.  
Telephone AUstin 9866

## NEW DESIGN Strong, transparent, plastic carbon test lamp, visible from any direction

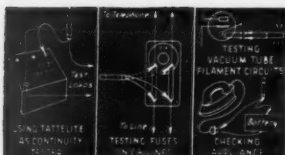


TESTS 110-250 VOLTS

Insulated pliers for testing and pulling fuses. Folding prongs fit base plugs. Test cord attachable. Can be obtained from G.E.—Westinghouse, or other first class jobbers

### STAR TEST POCKET PLIERS

235 Canal St. New York, N. Y.



## 3 LITTELFUSE Pocket TATTELITES

3-20 V., and 6-50 V. \$1.75 ea. 60-500 V., \$1.00

Check instruments, radio, communications, airplanes, etc., for open circuits and scores of troubles. "Tattelite tells the tale."

LITTELFUSE INC., 4789 Ravenswood Ave., Chicago, Ill.



The TORK CLOCK CO., Inc.  
MOUNT VERNON, NEW YORK



## "NO PRIORITY" Fluxes—Solders

Samples Free

L. B. ALLEN CO., INC.  
6715 Bryn Mawr Ave. Chicago

## ELECTRIC MOTOR



### FOR ALL MAKES

One of the largest consolidated stocks of motor, fan and controller parts on the east coast.

Write for Catalogue

READING ELECTRIC CO.  
INCORPORATED

200 William St. New York City

## Whenever

YOU NEED PRODUCTS

not advertised in a particular issue, write us. This Where to Buy Section supplements other advertising in this issue with these additional announcements of products essential to efficient and economical operation and maintenance. Make a habit of checking this page, each issue.

## ELECTRICAL CONTRACTING

*In the News*

[FROM PAGE 123]

insulating varnish, glyptal, varnished cloth and mica products.

C. K. Mead has been named as sales manager, C. S. Ferguson as engineer and H. K. Collins as superintendent. Accountant for this division will be E. T. Kilgore.

The division will make its headquarters in Schenectady, with the exception of Mr. Mead's sales operation which will remain temporarily in Bridgeport.

## Holophane Appointments

Clarence C. Keller has been appointed sales manager of the Holophane Company, Inc., New York. He has been assistant sales manager since 1934.

Davis H. Tuck has been made chief electrical engineer and the following district sales engineers have been appointed district managers in their respective territories: James A. Toohey working out of Chicago; H. R. Thompson, Cincinnati; E. H. Grieb, Milwaukee; Judd Lough, Atlanta; C. A. Patterson, Oklahoma City; Carl Gerhanick, Philadelphia; Jack Parks, Detroit; R. G. Dummel, San Francisco, and Frank Van Gilla, Los Angeles.



C. C. KELLER

## Westinghouse Appointments

The appointment of two new managers in the Aviation Section of the Westinghouse Electric and Manufacturing Company was announced recently. R. W. Gemmell was named manager of the Aviation Section, Industry Engineering Department, and W. A. Mechesney, manager of the Aviation Section under the Industrial Department.

H. B. Hodgins, an application engineer for Westinghouse in the Spokane, Wash., area since 1935, has been named manager of the Spokane office.

Sylvania Electric Products, Inc., announces the formation of an International Division with Walter A. Coogan as director. This is the first step toward preparation for increased world-wide operation and as part of its expanded activities, the International Division will include the operations formerly carried on by the Foreign Sales Department.

All-Steel-Equip. Co., of Aurora, Ill., announces the appointment of Frank C. Mahnke, Jr., as advertising manager.



## Pay As You Go

[FROM PAGE 41]

to the 20 per cent figure used in the "exact percentage calculation" and takes into consideration the status of the employee as reported in his withholding certificate exemption.

Remember that withholding does not affect the liability for income (including Victory) tax. Because an employer is not subject to withholding, does not exempt him from tax. The individual employer doesn't receive a salary in the eyes of the income tax law. His income is his net profit. From the standpoint of good accounting, the individual employer should continue to consider he receives a salary, otherwise, this expense will not be included in his costs and he would short-change himself when computing selling prices. From an accounting standpoint, his net profit is what is left after his salary and other expenses are deducted from sales and this procedure should still be followed but when filing a return he cannot include his salary as a part of overhead expense. As an employer under the new Act, the individual does not withhold part of his own compensation, but estimates his income on September 15th and then files an adjusted return in March.

This Act forgives the liability of any individual for 1942 taxes as of September 1, 1943. When the 1942 tax is not greater than the 1943 tax, the 1942 tax is completely forgiven, if not more than \$50. If more than \$50, the 1943 tax must be increased by 25 percent of the 1942 tax. Where the 1942 tax is greater than the 1943 tax, including the Victory Tax, the amount to be added to the 1943 tax is the sum of (1) the excess of the 1942 tax over the 1943 tax and (2) if the tax for 1943 exceeds \$50, an amount equal to 25 percent of the 1943 tax, or the excess of the 1943 tax over \$50, whichever is lesser. The amount in (2) shall in no case exceed 25 percent of the 1942 tax or the excess of such tax over \$50, whichever is the lesser.

The Victory Tax as a separate levy will be collected from few employees, only those who owe no regular income tax and then the tax withheld should be at least 3 percent of the excess over the prorated Victory Tax exemption of \$12 weekly.

In our opinion, recording tax deductions is now of such importance that the contractor must do a better job of it hereafter. It is no longer good practice to draw one check for payroll and post the total in one lump sum to the

payroll account. So many taxes must be taken out of each employee's pay that the contractor, large and small, must record the exact breakdown to avoid penalties. The government insists upon accurate recordings and unless the contractor installs an efficient tax-recording and tax-filing system, he will have trouble. Then too, the employer must furnish the employee with a written statement showing wages paid and the amount of tax withheld on or before January 31 of the succeeding year, also upon severance of employment. He must also furnish the Collector of Internal Revenue a statement showing wages paid each employee during the previous calendar year and the withholdings. Duplicates of these statements, if filed with the Collector, will supersede Information Return Form 1099, which is required otherwise to be filed February 15 of the year following payment of the wages. The withholdings on Income and Victory Taxes must be paid to the Collector or a designated depository but it is not necessary to itemize the tax for each individual employee.

Banks act as depositories for withholdings, hence, all contractors withholding more than \$100 during a month, must deposit this money in a local bank authorized by the government. The employer will get receipts for his deposits which he will mail, in lieu of cash, with his return.

Quite obviously, this involves more bookwork than was needed in the halcyon days when taxes were less of a headache and unless steps are taken to systematize and group this data properly, the contractor will find himself behind the 8-ball if asked to furnish proof of his figures. To effect efficient recording, we suggest that you purchase a special form for social security, wage and hour, withholding Victory Tax and other deductions from wages of employees.

Another requisite today is a "Tax File", in which place all receipts, duplicates of returns and other data pertaining to tax. Do not depend upon memory. Make a record of all tax business in sufficient detail to be able to give a lucid explanation to government auditors. Otherwise, there will be penalties.

One final word of caution, keep this tax money in a separate account. It mounts up quickly. Some employers in the past have used social security deductions in their business and then had to dig down to settle on the due date. This tax is comparatively small, hence, they were not inconvenienced financially to any extent but the withholdings today are much larger and you'll be in a tight spot if you don't have the money.

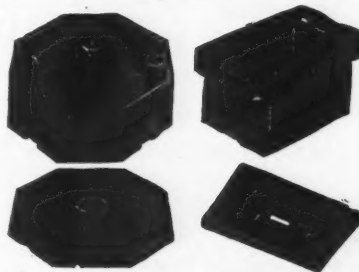
## ILLINOIS

Completely Insulated  
ALL PORCELAIN  
WIRING SYSTEMS

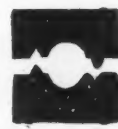
Save Critical Materials

Save Installation Time

Cut Maintenance



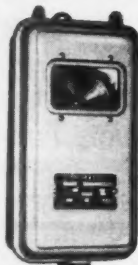
**Bull Dog**



**ILLINOIS  
ELECTRIC PORCELAIN  
COMPANY**  
Macomb, Illinois

★ An ILLINOIS Porcelain System enables you to do an outstanding modern wiring job—you are afforded every advantage in making easier, safer, more convenient, and efficient layouts—you can guarantee these porcelain systems for longest service life, for safety, and for greatest all round satisfaction. Porcelain does not rust or corrode. It is a logical wiring material because it conserves steel, zinc, copper, rubber. Grounding is unnecessary when you use this system. Clamps are not required for porcelain boxes. When you sell your next wiring, sell an ALL Porcelain System.

## Order a PARAGON TIMER Today



"Time Delay Relay"

If you need a Timer . . . order it from Paragon and early shipment will be made . . . provided, of course, you furnish the necessary priority rating. Even though Paragon is manufacturing extensive electrical equipment for the armed forces, it is making and shipping Time Control devices every day.

Timers are being used for more different applications today than ever. Send for a complete catalog today.

**PARAGON ELECTRIC COMPANY**

401 South Dearborn Street, Chicago, Ill.

**Paragon** *Chicago*

BUILDERS OF ELECTRICAL EQUIPMENT

SINCE 1905

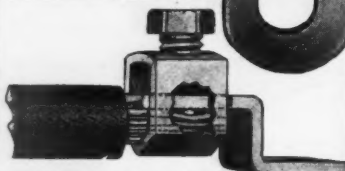
## ILSCO Electrical Connectors

### BOTH APPROVED

ILSCO SOLDERING LUGS  
ILSCO SOLDERLESS LUGS

Both are highest quality . . . both are practical . . . both are economical and dependable. It all depends on what you want 'em to do . . . and ILSCO has electrical connectors for every purpose . . . get the 32-page illustrated catalog and see the entire line.

ELECTRICAL CONNECTORS  
FABRICATED TUBE PARTS



MAIL THIS  
COUPON  
TODAY

Please send us sample of . . . and 32-page illustrated catalog.

NAME

FIRM NAME

ADDRESS

**ILSCO** COPPER TUBE  
& PRODUCTS, Inc.  
CINCINNATI, OHIO

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August, 1943

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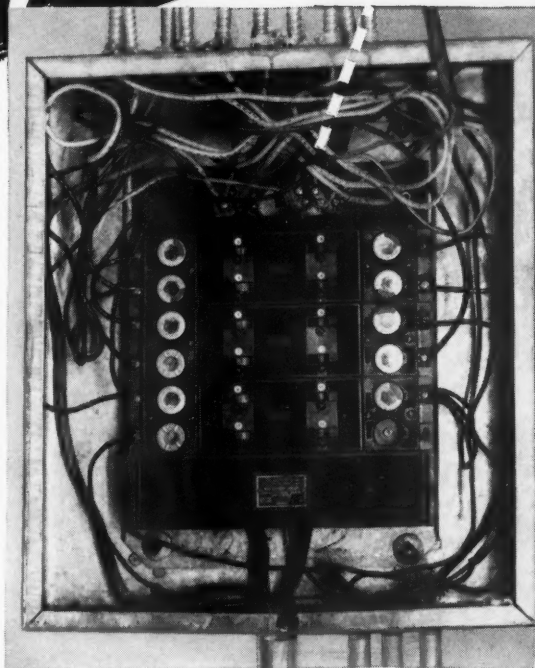
★ These companies have included Briefalogs, containing additional buying information on their products, in the 1943 edition of the Electrical Buyers' Reference.



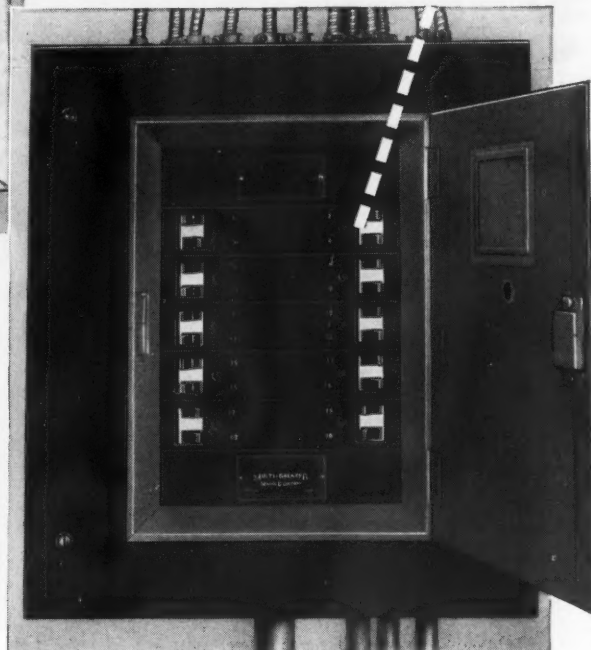
Problem

AND

Solution



**Problem:** An obsolete and overloaded fusible type panel. It provided only 12 lighting and power circuits. More were needed.

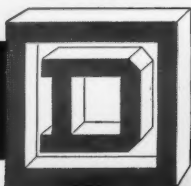


**Solution:**

A new Square D Multi-breaker panelboard, installed in the old box, using the same conduit. Provides 20 circuits... 66 $\frac{2}{3}$ % more capacity.

Multi-breaker lighting and distribution panels, when installed in existing panel boxes, usually increase the number of circuits by more than 50%. They eliminate fuses completely... provide modern convenience and protection. There's a lot of this profitable conversion business to be had... right now.

Square D equipment is distributed by 550 leading electrical wholesalers throughout the country



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**SQUARE D COMPANY**

DETROIT

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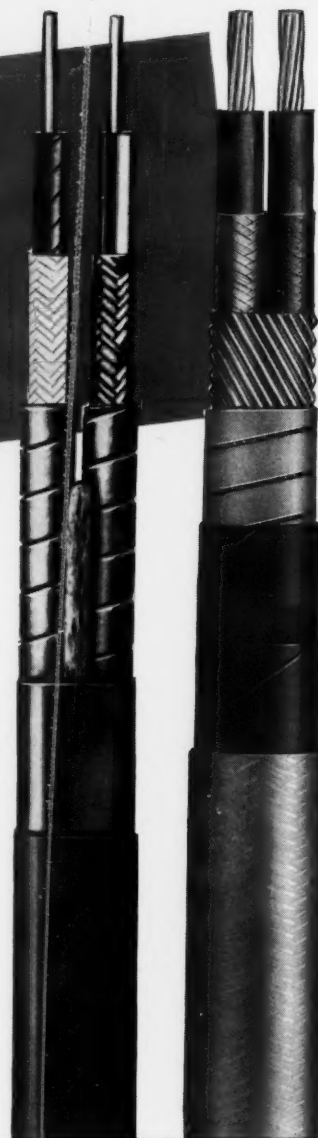
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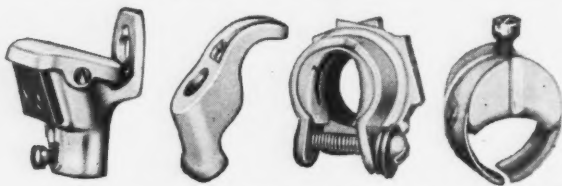
# G-E BRAIDX and SERVICE ENTRANCE CABLE for Wartime Wiring

Here are two cables that will meet your wartime wiring needs. G-E BraidX Non-metallic Sheathed Cable is ideal for factory wiring jobs (maintenance work, rewiring, new wiring) and for war housing installations. G-E Service Entrance Cable is recommended for use from the entrance cap to the meter equipment on war housing, barracks and other wartime structures.

Both cables are well made and will give long dependable service. Both save steel for the war effort. BraidX can be used in place of rigid conduit, EMT or BX wiring **except in hazardous or wet locations**. G-E Service Entrance Cable can be installed on the outside of the building without conduit protection.



## ELECTRICAL FITTINGS FOR WARTIME WIRING



There are over 450 different fittings in the G-E line—all of them particularly suited for today's needs. Fittings are available for BraidX, service entrance cables, other types of cables and for all types of raceways. These fittings are easy to use and will give dependable service.

FOR FURTHER INFORMATION on G-E BraidX, service entrance cables, electrical fittings, building wires or wiring devices, see the nearest G-E Merchandise Distributor or write to Section CDW-831- 8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

**GENERAL ELECTRIC**

## G-E BUILDING WIRES AND WIRING DEVICES

There are G-E building wires and wiring devices for every purpose: five grades of building wire including Type SN small diameter synthetic insulated and hundreds of switches, lampholders, outlets, etc.

